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THE GAS JOURNAL

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A Glance at the Contents—

Annual Congress of the French Gas Industry.

The Fifty-Third Congress of the French Gas Industry was held recently in Paris under the Chairmanship of M. Robert Ellissen, President of the Syndicated Union of the French Gas Industry. A wide range of subjects was covered by the various papers, extracts from some of which will be found on later pages. Others will be dealt with next week.

Two-Part Charging—Policy and Practice.

In an article on this subject the author maintains that our industry should now try to co-ordinate its views on present policy, at the same time intensifying its efforts to secure freedom on gas pricing. Nothing is lost, he says, by publicity on things needed. It is not good for an industry to be left guessing as to which way its future policy lies, or what steps it should take to ensure the realizations of that policy.

Wire Baking by Gas.

In a paper before the Annual Meeting of the Canadian Gas Association, Mr. O. L. Maddox, Industrial Gas Engineer to the United Gas and Fuel Company, of Hamilton, Ltd., Ontario, describes modern methods of wire baking by gas. Together with doing a job that is 100 p.ct. perfect, says the author, the actual cost of gas is 1575 c.ft. of 520 B.Th.U. gas for five tons of wire, 315 c.ft. per ton representing a cost of 15·75 cents per ton of wire baked.

The London Gas Agreement.

Reports are published of meetings of the South Metropolitan Gas Company and of the Commercial Gas Company which were held last week to consider an agreement between the Companies, to enable the Commercial Company to have the benefit of any premises, plant, organization, operations, or other facilities of the South Metropolitan Company in relation to the manufacture and sale of gas. At both meetings the terms of the agreement were unanimously approved by the shareholders.

An Excursion in Westphalia.

Mr. Michael Barash tells on later pages of the unique opportunity which was taken advantage of by participants in the Second World Power Conference of visiting modern super power stations and all types of large industrial works in the regions of the Rhine and Westphalia. The excursions were arranged so as to include places of technical interest while passing through some of the most beautiful scenery of Germany, and among the works visited and described were bituminous collieries and coking plants, iron and steel works, gas-works, long-distance gas supply plants, lignite mines and briquetting works, pump-fed storage plants, chemical works, technical colleges, and research institutions.

Leakage from Pipe Joints.

An interesting account is given by Mr. R. M. Conner, Director of the Testing Laboratory of the American Gas Association of the work which has been, and is being, done by the Pipe Joint Research Committee.

The "Concertina" Principle in Waterless Holders.

Our correspondence columns to-day contain an interesting contribution on the subject of the application of the "concertina" principle as applied to waterless gasholders in order to dispense with the liquid seal, in connection with the illustration appearing among the patent specifications in our issue for July 23. Our correspondent shows how the "concertina" is guided up the open framework of the holder so that there is but one gas-tight construction per holder, which, he suggests, is surely the best form of the application of this principle.

The Croydon-East Surrey Amalgamation.

A report is published of a Board of Trade Inquiry into an application by the Croydon Gas Company for an Order under section 10 of the Gas Undertakings Acts, 1920 and 1929. It is a long time since there was so much opposition to an Order under section 10; and the proceedings were reminiscent of the days before the Act of 1920 when so many big fights over Gas Bills took place in the Committee Rooms of the Houses of Lords and Commons. In the present instance no fewer than nine local authorities were in active opposition. The object of the Order is to authorize the Croydon Gas Company to acquire the East Surrey Gas Company and the Oxted and Limpsfield Gas Company, and to change the name of the Croydon Company to the Croydon and East Surrey Gas Company.

Disposal of Industrial Effluent.

Mr. L. F. Stemp discusses the recommendations of the Second Report of the Joint Advisory Committee on River Pollution, which, he says, is to be welcomed as an indication of the growing appreciation of the difficulties which beset industry with regard to the disposal of industrial effluent. The whole of the report is based upon the recommendation that the trader shall, subject to the other provisions of the report, be entitled as of right to discharge into the sewers, and the sanitary authorities shall be under a corresponding obligation to receive his trade effluent. The report outlines a certain machinery for the achievement of this end, of which the main feature is the calling of a meeting on the initiative either of the local authority or of any traders of the district for the purpose of drafting regulations relating to the method, manner, and conditions of discharge. All such regulations would have to be agreed between the local authority and representative bodies of traders, and in default of agreement either party might appeal to the Ministry of Health.

EDITORIAL NOTES

The Ever-Needed Lesson

THE Second Interim Report of the Committee on Education for Salesmanship deals exclusively with the subject of "Modern Languages"—how our comparative ignorance of the language of our customers abroad acts as a handicap to our export trade; how our Continental neighbours (other than the French) acquire their much greater command of other languages; and what questions have to be considered and answered effectively if we are to rid ourselves of our disability in this respect. Obviously, this Second Report of the Goodenough Committee (as it is now generally called) has far less interest for the gas industry than its very important predecessor had, or that its follower, the Final Report, will have. The one lesson it conveys, or, shall we say, once more emphasizes, is that in these days of fierce competition it is imperative for the salesman—which includes the manager as well as the actual selling unit—to study his customer in the most thorough and scientific manner possible; to ascertain exactly his needs and wishes, habits, customs, and mentality; and to concentrate his energies on securing the complete and lasting satisfaction of that customer.

In foreign lands, that means, in addition to the other aspects of Scientific Salesmanship, a complete knowledge of the customer's knowledge. Here, at home, in their own field of fierce competition, gas managers and salesmen have not to trouble about foreign languages—unless they have a Limehouse, Whitechapel, or Soho to supply—but they have got to study and serve their customers, day in, day out, with the utmost thoroughness and pertinacity. How many are really doing this, or have taken to their own hearts and minds the truth spoken not long ago by the Duke of York: "We must satisfy our customers, or perish?"

Leakage

MUCH valuable work is being undertaken at present by the American Gas Association in regard to the obviously important problem of leakage from mains. A year ago the Association appointed a Pipe Joint Research Committee, and already this Committee, who are carrying out their investigations at the Cleveland Laboratory, have accumulated highly interesting information on the various methods of making and repairing cast-iron pipe joints. Some of this information was imparted by Mr. R. M. Conner, Director of the Cleveland Laboratory, to members of the Canadian Gas Association at their last annual meeting; and on later pages will be found a report of what Mr. Conner had to say on that occasion. He prefaces his observations on the results of the past year's researches by calling attention to the fact that the total output of the manufactured gas industry of the United States in 1929 was about 586,000 million c.ft., of which 7½ p.ct. (the leakage figure) was wasted—which wastage is equivalent to a loss of something like 42 million dollars. If it were possible, he remarks, by some means to reduce this figure by as much as 50 p.ct., a tremendous saving would result each year. These figures, of course, are very impressive, though we never take leakage statistics quite literally, for we are never sure what amount of the unaccounted-for gas can be correctly attributed to leaking joints, and what quantity ought to be set against measurement errors due to temperature variations. At the same time, every effort to reduce this particular loss—and it can be reduced—is justified in more ways than the purely financial one.

The testing programme which is being followed by the American Gas Association ought to commend itself to our readers. The first thing they did was to determine the manner in which joints of various types withstand the tension and compression of the pipes when laid, caused by temperature changes in the soil. In the tension test, a load equivalent to that which would be produced by contraction of the pipe due to a definite fall in temperature is applied to the bell of the spigot and the bell joint. After each joint has been subjected to the tension test, it is compressed to restore it to its original position. During the whole of the examination a constant air pressure is maintained in the pipe. An alternate tension and compression test is considered as representing the ultimate effect of a year's variation in temperature. Without going into any detail regarding the numerous findings of these experiments, we may emphasize the chief conclusions drawn from the year's work. First, smooth surfaces of the bell and spigot are highly desirable in the case of cast-lead joints; secondly, joint leakage appears to be more a function of the pressure carried than of the kind of joint employed—both cement and lead joints proved uniformly unsatisfactory for pressures greater than 1 lb.; thirdly, the successful performance of a cast-iron pipe joint seems to depend more upon the type of joint and its physical arrangement than upon the quality of the material used in its preparation.

The foregoing is a very bald indication of a type of investigation which appeals to us not only because of the care which is taken to reproduce in the laboratory effects similar to, if not closely comparable with, those on the district, but because it is essentially a co-operative endeavour. Engineers in various parts of the United States and Canada are doing their share by placing at the disposal of the A.G.A. Committee full particulars of their experiences and practices on the district. That the value of the work is being recognized across the Atlantic is indicated by the fact that the Cast-Iron Pipe Research Association have asked the A.G.A. to undertake the testing of certain kinds of patented joints, and are paying for the investigation. We look forward to further reports of the work of the Pipe Joint Research Committee, particularly on that section dealing with the leakage caused by ground settlement and vibration. Experience of the Committee so far indicates that vibration is "a subject to be very thoroughly "reckoned with, though we do not believe that it deserves "the importance that some engineers are inclined to "ascribe to it." At present, "it is almost impossible to "arrive at any general conclusion."

Methods of Charge

BY a strange coincidence, we are in a position to refer, in the issue of the "JOURNAL" which contains, in another part, a spirited article on "Two-Part Charging" for the gas industry, to a report drafted by a Committee appointed by the Electricity Commissioners. The duty of this Committee was to consider the various kinds of charges and tariffs offered by authorized undertakers in connection with the supply of electricity for lighting, domestic, office, and power purposes, and to formulate definite proposals for securing a greater measure of uniformity. The conclusions and recommendations of the Committee have not yet been considered by the Commissioners, but the matter was righly deemed of sufficient importance to warrant immediate publication by the Stationery Office. There is a good deal in the report which should prove suggestive to the gas industry in studying its own case, in addition to the necessity of studying the methods of charge of a competitor.

When considering the flat rate as applied to domestic supplies, there can be little difference between the problem presented to gas and electricity suppliers respectively; and in this connection the Committee's statement would represent the views of many in our industry, with the sole alteration made by substituting "gas" for "electricity." The Committee say: "It has become obvious "to those who have studied the results of the working of "the flat rate method that it does not constitute an equit-"able method as between the supply authority and con-"sumers, or allow of that discrimination which should in "fairness be made between domestic consumers in ac-"cordance with the characteristics which govern the cost

"of supplying the consumer—*i.e.*, the nature, extent, "and period of the various uses of electricity. One of "the objects of the introduction of a multi-part tariff was "to counteract this inequity as far as possible." They state emphatically that it is to the advantage of all supply undertakings and their consumers that a standard multi-part tariff should be offered for general domestic supplies. The Committee are, too, of opinion that supply authorities should so adjust their tariffs as to ensure that they are adequate to provide a return which, averaged over a period of years, will be sufficient to meet any cost due to the rare occasions when exceptionally cold weather prevails; also that a minimum quarterly charge should be enforced on consumers on the flat rate. Again, consumers should receive every encouragement to wire their houses throughout, and to install lamps of a size which will give liberal illumination.

The Committee strongly advise the cessation of the present multiplicity of tariffs; and they favour as a statutory multi-part tariff for domestic supplies (at the consumer's option, as an alternative to the flat rate), one based on the size of the house, as a fixed charge, with the addition of a charge per unit supplied. To arrive at this fixed, or service, charge, their proposal is to ascertain the area in square feet of the ground floor of the private dwelling-house by taking external measurements, and to multiply this area by the number of floors—due allowance being made for part floors. As it is not practicable to charge higher flat rates for lighting to lighting consumers who are less profitable than others, the Committee point out that the only course open to the supply authority is to charge a flat rate which will secure from the short-hour lighting consumers on the flat rate the full amount of revenue required to meet the cost of the current supplied and the standing charges. In the case of the multi-part tariff, the fixed charge portion should bear all the standing charges, and the secondary, or unit, charge should be as low as practicable. The basis for the fixed charge portion follows the gas industry's lead at Halifax, to which so much attention has been devoted.

The report (which is issued at 1s. 6d. net) also recommends tariffs suitable for business and office premises, industrial power supplies, and rural areas.

Smoothing the Path of the Consumer

THE recommendation of the Committee above referred to, that consumers should receive every encouragement to wire their houses throughout, and to install lamps of a size which will give liberal illumination, leads us to the consideration of another report which was issued by the Stationery Office at the same time, at the price of 1s. net. This is by a Committee who were appointed by the Electricity Commissioners to ascertain what steps can be taken to ensure that facilities for assisted wiring and for the hire and hire-purchase of apparatus are made available, and to formulate proposals for a practical financial scheme for the purpose. It should be pointed out that the conclusions and recommendations set forth have not, in this case also, yet been fully considered by the Commissioners; but the time is opportune for the gas industry to take note of them. As the result of a questionnaire, it was gathered that, of 650 undertakers, 230 had not incurred any expenditure on either kind of facility alluded to in this report. The two matters of assisted wiring and provision of apparatus had to be considered separately by the Committee, by reason of the fact that when once wiring is installed in premises it is a non-realizable asset from a financial point of view.

At the close of the year 1928-29, only 213 of the 650 authorized undertakers who were actually or in process of providing supplies had incurred expenditure on deferred payment wiring schemes, and the Committee feel that such facilities should be generally available in all areas of supply. If a policy of this kind is to be adopted, it is obvious that there must be means of ensuring, as far as possible, the payment of the sums due from consumers, and to this end it is proposed that parliamentary powers should be sought to enable undertakers to discontinue the supply of electricity in case of default, just as they are now permitted to do when there is failure to pay for the current. Obviously, monetary considerations are of extreme importance, for wiring is expensive; and though the larger undertakings can doubtless take care of themselves, many of the smaller ones would find themselves up against a difficult problem. Therefore, the Committee have discussed various methods whereby facilities for assisted wiring could be financed, and they suggest a combination of some existing financial organization with the interests most closely concerned. The Commissioners themselves would keep a watchful eye on the progress of events. They would "in due course call for a report from the undertakers as to the steps taken by them in the matter, and issue in their annual report or otherwise a yearly statement of progress of assisted wiring schemes throughout the country."

So far we have been considering proposals for deferred payments, which differ from hire-purchase in that they follow an initial sale; but when we come to appliances other considerations arise, and the Committee believe that hire-purchase (under which the apparatus remains the property of the seller until the last payment is made) offers greater promise of cheap credit facilities than an initial sale followed by deferred payments. At the end of 1928-29 less than 50 p.ct. of the 650 authorized undertakers had incurred expenditure in providing such facilities; and the Committee recommend that those who have not done so should be urged to put into force their powers of providing electrical apparatus to consumers on hire or hire-purchase terms. The financing, where necessary, would be by means of Joint Development Committees, as in the case of assisted wiring.

Making Gas History

THOUGH this is doubtless the greatest holiday time of the year, the "JOURNAL" records outstanding events in the history of the gas industry. In the first place, there is the approval by both sets of proprietors of the agreement that had been provisionally entered into between the South Metropolitan Gas Company and the Commercial Gas Company. Full reports of the proceedings at the two meetings are printed in this issue; and here it may be added that on each occasion there was absolute unanimity. To some extent this may be traced to the fact that an agreement on similar lines (except that in this one there is no provision for the supply of gas in bulk) between the South Metropolitan and the South Suburban Gas Companies has already been sufficiently long in operation for a thorough test. Nevertheless, the harmony which pervaded last week's meetings must have been very gratifying to the respective Chairmen and Boards of Directors, indicating, as it did, the complete confidence of the proprietors in those who are administering their affairs.

In the main, the agreement thus sanctioned provides for the South Metropolitan Company making and giving information as to analyses of coal or residual products for and to the Commercial Company; testing apparatus for the Commercial Company; giving them advice and assistance in relation to the purchase and sampling of coal and production and disposal of residuals products; and unloading coal at the South Metropolitan Company's East Greenwich landing stage, and placing it into barges for the Commercial Company. The terms of the agreement include that the Commercial Company and their Directors shall endeavour to secure that proprietors of £691,093 of ordinary stock of the Commercial Company shall exchange the same for £635,805 of 6 p.ct. irredeemable preference stock to be issued by the South Metropolitan Company, and that the Commercial Company shall endeavour to obtain powers to enable them when issuing fresh capital to issue a certain portion of it to the South Metropolitan Company.

The second outstanding event of which particulars will be found on later pages—where appears an account of the first two days' proceedings at the Board of Trade inquiry—is the proposed acquisition by the Croydon Gas Company of the undertakings of the East Surrey Gas Com-

pany and of the Oxted and Limpsfield Gas Company. Thus we are, in a single issue of the "JOURNAL," able to give readers examples of two different schemes having the same object in view—that is, the furtherance of the best interests of the great gas industry.

The Unprotected Shareholder.

In a recent speech, Mr. Henry Morgan, the President of the Society of Incorporated Accountants and Auditors, commented severely on the lack of protection for shareholders, pointing out that under existing Company Law Directors can afford to treat with contempt the efforts of shareholders to exercise any influence over the affairs of their Company or the constitution of the Board. He indicated what he thought would be a simple remedy—namely, to provide shareholders with a fair and proper method of recording their votes. If this were done, many of the grave abuses of public company practice would rapidly disappear. Urging that further revision of the Companies Acts, Mr. Morgan found an ample text in financial occurrences during the past two or three years.

Voluntary Daylight Saving.

Most people in this country, outside the farming community—have by this time become reconciled to daylight saving by law. It is interesting to note that, even where there is no question of compulsion involved, the advantages of the principle are sometimes recognized. The more important cities of the United States, for example, have in recent years adopted the practice of starting the day's work an hour earlier during spring and summer, and ending it an hour earlier. This is known in Baltimore as Voluntary Daylight Saving, and it is a scheme in which the local Gas and Electric Company have joined. It is, in fact, a general practice among the business community of the city. But however great the unanimity, it seems that this country's method of dealing with the matter is probably the better one.

Another Two-Part Tariff Recruit.

Among the recent recruits to the growing battalion of gas undertakings who are offering their consumers attractive tariffs is the Heywood Corporation Gas Department. Their optional two-part system is based upon a fixed sum of 10s. per quarter, with a charge for gas at the low figure of 2s. 8d. per 1000 c.ft. (7·11d. per therm), less a discount of 2d. per thousand. If a consumer uses 35,000 c.ft. per annum, the saving over the flat-rate tariff (gas at 4s. 3d., less 2d. per 1000 c.ft.) amounts to 15s. 5d. This new basis of charge, which is, of course, optional, should encourage the use of gas for both heating and water heating.

Profit-Sharing Schemes Analyzed.

A comprehensive study of selected schemes in existence for sharing profits with employees has been made by the Metropolitan Life Insurance Company of New York, who are willing to communicate to those interested the results of their investigation, if application be made to the Company's British Isles Head Office, Bush House, Aldwych, London, W.C. 2. Our own industry has taken a leading part in the establishment of this efficacious method of securing the interest of employees in their work, and appropriately two of the twelve representative British schemes surveyed are those of gas companies. As recently as in the "JOURNAL" for July 23 it was shown that at the end of 1929 there were nearly sixty schemes in operation in the gas industry of Great Britain, but satisfactory as this number may be there is still ample scope for increasing it. Times are more difficult to-day than when the South Metropolitan Gas Company's first move in this direction was made, over forty years ago, but the advantages of co-partnership are no less now —they are probably even greater—than has been the case under any other industrial conditions. It is gratifying, in view of the pioneering work undertaken by the gas industry, to note the remark of the Metropolitan Life Insurance Company that this country has been definitely in the lead in working out satisfactory plans of this sort. The reputation for being thus in the van of progress is one which we should like to see the industry maintain.

A Reasoned Review.

Though it would be hardly correct to describe as optimistic the Trade Forecast and Business Barometer for the Third Quarter of 1930 issued by the Federation of British Industries, it does suggest that the worst phase of the present depression is almost at an end. Various methods of accelerating a revival in trade are discussed, and the view is expressed that the most hopeful line of approach lies in the redirection of our national savings at home and overseas.

The Beauty of a Gasholder.

"Is the gasholder an object of beauty or is it an eyesore?" asks the "Co-Partnership Journal" of the South Metropolitan Gas Company in its current issue. "Before judgment is passed on the gasholder," states the Journal, "it would be well to consider on what grounds criticism is to be based. Prof. W. R. Lethaby, whose right to be regarded as an authority can hardly be disputed, has defined Architecture as 'masterly structure for a worthy purpose with adequate workmanship.' Man is continually creating things for his use, from houses in which to live to gasholders in which to store the means of lighting and heating those houses. In both these cases he is responding to a necessity. Whether the things he creates to serve a particular purpose are 'beautiful' or not depends, therefore, upon the worthiness of the purpose and the honesty of his response to it. We may claim for the gasholder that, so long as it does not pretend to be anything more than a good gasholder, it is quite an honest, dignified solution of a worthy purpose. It is built with that essential economy of material by which the engineer almost unconsciously produces pleasing line and form."

Humanity in Industry.

At a breakfast given recently by the Industrial Christian Fellowship, at the invitation of the Bishop of Lichfield, at which the Archbishop of York was present, Sir David Milne-Watson, Vice-Chairman of the Federation of British Gas Industries and Governor of the Gas Light and Coke Company, spoke on the relation of Christianity to industry. Civilization, said Sir David—that is, the whole fabric and habits of life and thought, institutions and laws, all fashioned historically by man—is a neutral thing. It is sometimes good, sometimes evil, according as it is used by human wills, just as science and capital are only good if rightly used. Industry, like all other human organizations, is always in a transitional stage, always developing according to the needs of the time; and while it is the obligation of a modern industrialist to conduct his business on up-to-date and scientific lines, it is also his duty to apply the general principles of humanity. In his opinion, the two chief things which are wrong with industry at the present moment are selfishness and inefficiency.

Develop Personality.

It would not be possible to do away with specialization, continued Sir David, but to counterbalance this, the men can be given outside interests in the business. They can be given an interest in its welfare by means of co-partnership or some other schemes of like character; and their help may be enlisted in various enterprises connected with the business, if not directly in the management. It is no use laying down beautiful schemes which do not embody the interest of the individual. Any system which develops man's personality, and his self-respect, will help to free him from the deadening effects of being regarded merely as a "hand." What we need at the present time in business are mutual self-sacrifice, mutual loyalty, mutual desire to give the best of brain and muscle, mutual desire that all shall share in the fruits of labour and that none shall claim too great a share.

PERSONAL

The numerous friends of Mr. JOSEPH SADLER, who for many years has represented Messrs. John Wright & Co., of Birmingham, will be interested to learn that he has now joined the Parkinson Stove Company, Ltd., and will take care of their interests in parts of Southern and Eastern England as from

Mr. J. Sadler.

Aug. 1. He will also be calling on many of his old friends on his old ground. Mr. Sadler has been professionally connected with the gas industry all his life, the first ten years of his career being spent with the Newport (Mon.) Gas Company, whom he left to join Messrs. John Wright & Co. His present address is: 38, Fields Park Road, Newport (Mon.).

Following upon the annual meeting of the Society of Chemical Industry in Birmingham, Lord BROTHERTON informed the Lord Mayor of Birmingham of his intention to subscribe £2000 to the Hospitals' Centre Appeal Fund.

After breaking all Departmental records for length of service, Mr. J. A. JARRATT, Deputy-Superintendent of the Rental Department of the Gas Light and Coke Company, Westminster, retired on June 30. He had more than completed fifty-two years' service in the Company, having been appointed as a Junior Clerk on May 31, 1878.

OBITUARY

The death has taken place of Mr. ALEX. AMBROSE, Gas Manager at Bathurst, New South Wales, Australia, the eldest son of Mr. John Ambrose, for many years Gas Manager at Bo'ness.

Forthcoming Engagements.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Aug. 19 and 20.—IRISH ASSOCIATION OF GAS MANAGERS.—Meeting in Dublin.

Sept. 8-11.—ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.—Annual Meeting and Conference at Leicester.

Sept. 9.—FEDERATION OF GAS EMPLOYERS.—Meeting of the Central Committee.

Sept. 9.—NATIONAL GAS COUNCIL.—Meeting of the Central Executive Board.

Sept. 11.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting at Aberdeen.

Sept. 18.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—General Meeting at Porthcawl.

Sept. 18.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Sept. 26-28.—NATIONAL SMOKE ABATEMENT SOCIETY.—Annual Conference at Leicester.

Oct. 10.—MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—Visit to the Manchester Corporation Gas-Works at Partington.

Oct. 27 to 29.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Meeting at Hull and Bridlington.

Nov. 19.—SOCIETY OF BRITISH GAS INDUSTRIES.—Autumn general meeting in London, under the Presidency of the Right Hon. Lord Eustace Percy, M.P.

CORRESPONDENCE

Correspondence Classes.

SIR,—I am very much interested in the correspondence which you have been publishing in "GAS JOURNAL" on the subject of "Correspondence Tuition," or Home Study Courses, as we would call it, and also in your editorial on correspondence classes in the "JOURNAL" for June 18. You probably know of the Home Study Course on Manufactured Gas which has been offered by the Home Study Department of Columbia University since October, 1926. I may say that up to the present time over 1500 men have been enrolled in this course, and about half of them have completed.

In conducting the course I am very much struck with the earnestness of the men who enrol in it. These men spend on an average of from twenty-five to thirty hours on each lesson—a total of six hundred to seven hundred hours on the course. When one considers that the time is spent during the evenings and at other times outside of working hours, it certainly shows a very keen desire on the part of the men to learn more about their industry and to fit themselves for promotions.

I should be glad to furnish any further information regarding the course to anyone who is interested either as a prospective student or from an educational standpoint.

J. J. MORGAN,
Associate Professor of Chemical Engineering, Home Study.
Columbia University,
City of New York,
July 19, 1930.

SIR,—My contribution to the discussion on Correspondence Classes was not intended as a criticism of the work of the Halifax Gas College. I assure Mr. Coe that I have no knowledge of his classes, or students, other than can be acquired from the schedule he gives in his letter in the "JOURNAL" for June 25, and a casual glance through a copy of his course.

There is nothing derogatory in my paragraph referring to the College, neither do I imply that they employ short-cut methods. The "easy-going external candidates" I had in mind do not trouble themselves with tuition by correspondence.

If Mr. Coe takes exception to the sentence in which I question whether correspondence classes will produce the men the industry requires, he might have taken his stand against the suggestion, in your editorial of June 18, that "No one with experience would affirm that correspondence tuition offers anything like a complete substitute for class tuition in technical institutes."

In the same editorial, you invited readers to express their opinions of the proposal to establish a University Correspondence College with the approval of the Institution of Gas Engineers. Prof. Cobb has replied to the discussion, and he might well have added: "No one with experience would affirm that the Institution Education Scheme offers anything like a substitute for a course at the University of Leeds."

J. MOGFORD.

Aug. 2, 1930.

Gas Fire Campaign.

SIR,—I have perused with particular interest the leading article in the "JOURNAL" for July 23 under the heading of "Gas Fires and Summer Heat." The industry has all too long talked of the gas fire "season," and in so doing we have, as you rightly point out, relaxed our efforts to sell gas fires in the spring and summer, and left the field open to our electrical competitors.

A gas fire for the occasional cold and damp days of summer

is a real need in every home, and if this is not appreciated by the public, it is because we ourselves have erroneously considered the gas fire business as seasonal.

I am doubtful if the hiring of gas fires on simple hire is a desirable practice, as it is possible to offer gas fires on hire purchase terms over four or five years at a rate which is not greatly in excess of the simple hire rate. The advantage of this is that it overcomes the difficult question of obsolescence.

There is undoubtedly a tendency in all undertakings offering fires on simple hire to maintain in use types which, while reasonably efficient, are out of date in appearance and less attractive in that they do not harmonize with modern decorations as well as patterns developed (say) within the past few years. An undertaking operating a simple hire scheme for gas fires should, I consider, fix such hire rates as will permit of the scrapping of not less than 10 p.ct. of the total fires per annum in order to keep all appliances on hire in consumers' houses up-to-date.

The long period hire-purchase system offers great advantages, as the consumer looks upon the payments as a hiring, and is usually ready to replace a gas fire with a new one that appeals, if only from the æsthetic point of view, when the hire purchase payments are completed.

At the moment simple hire and a hire-purchase scheme for gas fires are being operated at Stretford; under the former the scrapping of fires is to be carried out on the basis mentioned, and it is hoped, by making the hire-purchase terms sufficiently attractive, to supersede simple hire.

The question of ventilation is important, and while the volume of products from a gas fire is less than from a coal fire, the flue should be of such dimensions, and constructed in such a manner, as to ensure adequate ventilation in the room which it serves. The practice of running out gas fire flues at the eaves or discharging into cavity walls has been all too prevalent, and to the great disadvantage of the gas fire.

I agree with your contention that the question of the development of the gas fire load is to-day of vital importance. We start with a great advantage over our heating competitors in the matter of economy, cleanliness, efficiency, and ventilation; and it is for us to bring home these facts to the public by service and publicity.

W. M. CARR,
Engineer, General Manager, and Clerk.
Stretford and District Gas Board,
Stretford,
July 29, 1930.

Recovery of Ammonium Chloride.

SIR,—The abstract from the Sixty-Sixth Annual Report of Alkali Works, and your editorial comments relating to the recovery on the practical scale from a coking plant of ammonium chloride, and of laboratory experiments relating thereto, are vastly interesting in their technological aspect, and alluring on the commercial side of coal carbonization. It may be hoped that those in a position to do so will pursue this investigation, and freely give of their experiences, so that if the recovery of ammonium chloride as a separate product on coking and gas-works plants is really a sound commercial proposition, practice may quickly turn it to full advantage.

You ask "Will it pay?" That is the present crucial issue, and before it is completely answered enlightenment is needed on various aspects, some of which are here set out in the form of queries, viz.:

(1) Does the Wombwell Coke and Bye-Product Company, Ltd., which recovers, according to the Alkali Inspector's Report, 3 lbs. of ammonium chloride (86 p.ct. of the total) per ton of coal carbonized find a ready market for its product?

(2) How far does the product fall short of 31·77 p.ct. of (pure) ammonium chloride content? Apparently no attempt is made at Wombwell to remove the higher tar acids other than monohydric phenols, which are volatilized during evaporation of the 15 p.ct. ammonium chloride solution withdrawn for treatment when the sprays and cyclone have effected that degree of concentration. If that is so, the percentage of ammonium chloride in the recovered crystals would seem to be 30 p.ct. or less, and the crystals liable to discoloration.

(3) The Report states that, since there were 2774 tons of ammonium chloride imported into Great Britain in 1929, "There should therefore be a ready market for home-produced material." Would that assumption obtain if recovery of ammonium chloride as a separate product were general practice? Together, gas-works and coke ovens carbonize about 35 million tons of coal. At a yield per ton of 3 lbs. the product for disposal would be 46,875 tons. It appears, therefore, that if the market is to be measured by the quantity imported, not more than the crude gas from 2 million tons of coal could be treated without the market encountering severe depression in product price by over-production, as in the case of the ammonium sulphate market.

It is premature as yet to ask for a working statement which will set receipts for ammonium chloride against the cost of concentration and evaporation, but it is hardly needful to say that satisfactory information of this sort will give the quickest "boost" to an extension of recovery. In assessing the benefits of recovery, the fact that ammonium chloride, especially on vertical retort systems and in tar distillation, imposes special attention has to be taken into account. Also, it must not be lost sight of that the cost of recovering sulphate from liquor denuded of chloride is lessened; less liming is necessary, and less vitriol is needed. There is here plenty of scope for the chemico-statistician to display his capacity for putting results and estimates in the form of £ s. d.

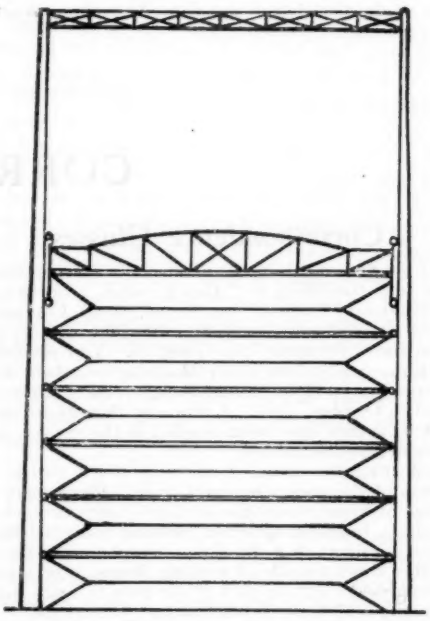
How far commercial considerations are affected by marketing chloride, *plus* or *minus* agitation with lead carbonate for the more complete removal of tar acids, is a matter which needs further inquiry. A higher degree of purity is attainable by special treatment, but is the market value of the product so improved as to make the special treatment worth while? Some information on the different grades of purity which the market is capable of absorbing would be welcome. Tar distillers, usually also distillers of ammoniacal liquor, should be able to contribute information on the various outlets for ammonium chloride, and the degree of purity needful to meet the individual needs of classified customers. The Report of the Alkali Inspector says "Experience shows that even a small proportion of ammonium chloride in tar has a most detrimental effect on tar stills." That being so, tar distillers stand to benefit according to the degree by which ammonium chloride can be kept out of the tar, and should therefore evince no reluctance in encouraging any process which effects elimination before tar leaves the gas-works.

"SCRUTINEER."

Aug. 1, 1930.

Waterless Holders.

SIR,—The fact that the "JOURNAL" for July 23, p. 210, is able to produce evidence of the efforts of invention to dispense with the liquid seal in waterless holders will be more convincing to the minds of many than all the voluminous statements that have been made that the tar seal is a perfect solution.



The particular application of the "concertina" principle illustrated is not the only application which has been considered. Reference to the illustration on p. 210 will show that the gas is stored between the concrete envelope and the "concertina" fabric; hence two gas-tight constructions are necessitated per holder.

In the application which is interesting the writer, the "concertina" is guided up the open framework of the holder, so that there is but one gas-tight construction per holder—viz., the "concertina"—surely the best form of application of this principle (see sketch).

"ANGLAIS."

July 30, 1930.

THE NEWS OF THE WEEK

The Bewdley Town Council have accepted the tender of the Bewdley Gas Company for public lighting in the town during the coming winter for £226 12s. 4d.—the same price as last year.

At a Gala at Fleetwood, on Saturday, Aug. 2, the Fleetwood Gas Company's motor-car won the first prize in the class for neatest and cleanest motor, and the Gas Workers' Institute were awarded 6th prize for the tableaux "Our Citizens."

After 45 Years as Blacksmith at the Valley Road Works of the Bradford Corporation Gas Department, Mr. J. Waterworth is retiring. He has just reached his 65th birthday and is in excellent health. He estimates that in his time he has lit the smithy fire 150,000 times.

The Aerodrome Committee of the Hull Corporation have further fully considered the matter of the alternative site for the East Hull Gas Company for the erection of gas-works and have appointed a special sub-committee to consider the matter and to submit recommendations thereon direct to a special meeting of the Council as early as possible.

Mr. A. R. Bisset, the Engineer and Manager of the Douglas Gas Light Company, was the Hon. Organizer at the recent Isle of Man Highland Games, which were an enormous success, some 12,000 people being present. Fifty of the employees of the Gas Company took part in one of the pageants. The Marquis of Douglas and Clydesdale, who is Chieftain of the Games, was present.

New Showrooms of the Gloucester Gas Light Company, at their premises in Eastgate Street, were opened on Monday of last week by the Chairman of the Company (Mr. J. H. Jones). The altered building presents a spacious showroom in which are displayed gas cookers, fires, refrigerators, washing machines, water heaters, and other fittings. The rooms are decorated with light oak panels. A modern shop window has been fitted, and the whole place re-decorated.

The Steady Growth of Co-Partnership is referred to in the current issue of the Ministry of Labour Gazette. According to the latest statistics available, there were at the end of last year 260,000 employees entitled to participate in 495 schemes, as against 192,000 persons in 444 schemes in 1923. The most important groups adopting co-partnership principles are the gas, water, and electrical undertakings, which total 65 firms, and have 46,100 workpeople entitled to benefits. The oldest, and in many ways the most comprehensive, scheme is that of the South Metropolitan Gas Company, who employ nearly 10,000 persons, and, as the result of co-partnership, have for nearly fifty years been free from all labour difficulties.

The Question of the Cost of Production of gas was referred to at a recent meeting of the Port Talbot Town Council, when Alderman T. Mainwaring drew attention to a minute calling upon the Gas Manager to prepare a complete report as to the comparative cost of producing gas at the Council's works and that of purchasing it in bulk from Baldwins, Ltd., and moved that it be referred back. The Mayor (Alderman J. J. Edwards) pointed out that all they proposed doing was to secure a report as to the relative cost of the gas produced at their works as compared with the price on which it could be purchased in bulk. Mr. Brown urged that if they could purchase gas cheaper than they could make it themselves they should consider the matter. The minute was referred back.

York Councillors Have Waxed Indignant about the action of the York Gas Company in having erected a large new gasholder near Hart's Terrace, Layerthorpe, which has obliterated the view of York Minster as formerly seen from East Parade, Heworth. Speakers at the City Council meeting, last week, spoke about the Gas Company having "taken unfair advantage of their powers," "disfiguring the neighbourhood," "showing a lack of public spirit," and so on. One member said it was quite time the City Council obtained powers to control the height of public buildings. The meeting passed a resolution asking the Gas Company to consult the City Engineer before erecting any further gasholders, with a view to their erection in a less conspicuous position. It was, however, reported that the Streets and Buildings Committee had already written the Gas Company, who had replied that it was hardly fair to criticize a thing which was only half done, and that when it was completed and painted the gasholder would not be at all so unsightly.

Proposals for Celebrating the Centenary of gas supply in the Penrith district have been reported to the Penrith Urban District Council by a special sub-committee appointed to consider the matter. The date fixed upon for the celebration, and approved by the Council, is Nov. 24 next, as gas was first supplied to the town on Nov. 24, 1830. Further details were left to the sub-committee for a later report.

An Increase in the Price of Gas was approved at a meeting of the Stafford Town Council on July 29. The recommendation put forward by the Gas Committee was to increase the price by 2d. per 1000 c.ft. as from the September readings. Councillor G. Owen stated that expenditure on the repair of mains had been responsible for the depletion of their funds, and the Committee had deemed it necessary to increase the price of gas in order that they might be able to build up their reserves. The recommendation was strongly opposed, several members urging that the time was not opportune to place further burdens on consumers, especially those engaged in industries. It was stated that the 2d. increase would yield £1650 a year. A motion to refer the recommendation back was defeated by fourteen votes to twelve.

C.W.G. Plant Inaugurated at Hastings.

Last month the Mayor of Hastings, Mr. F. M. Russell Davies, K.C., opened a new carburetted water-gas plant at the Hastings and St. Leonards Gas-Works. The ceremony, which was attended by a large gathering, was preceded by a luncheon at the Queen's Hotel, when Mr. C. F. Botley, Chief Engineer and General Manager of the Hastings Gas Company, explained that the Glyne Gap Works were completed in 1904, and in the twenty-five years that followed the number of consumers had grown from ten thousand to eighteen thousand. The quantity of gas made had increased 50 p.ct., though practically the same amount of raw material was used; and although the price of coal had been increased by 9s. per ton, in the twenty-five years, yet the price of gas was now 3s. 10d. per thousand, as compared with 3s. in 1904. These figures showed that, although the enormous progress made lately in the gas industry might have rendered certain parts of the Glyne Gap plant out of date, as compared with works erected at a later time, yet this did not prevent the manufacture being carried on efficiently.

After luncheon the party proceeded to the Glyne Gap Works, where the Mayor, having inaugurated the new C.W.G. plant, was presented by Mr. Botley with a silver cigarette case to mark the occasion.

Gas for Motive Power Purposes.

The price of gas sold for motive power purposes at Brighouse will, as from July 1 last, be 2·6d. per therm (1s. 1d. per 1000 c.ft.), subject to a discount, for prompt payment, of 0·2d. per therm (1d. per 1000 c.ft.), making a net price of 2·4d. per therm (1s. per 1000 c.ft.). This price is to remain in force for at least five years from July 1, subject to the following conditions:

(1) The price is based on the net cost of coal, which for the year ended March 31, 1930, was 1·52d. per therm (7·6d. per 1000 c.ft.). For every rise or fall of 0·2d. per therm (1d. per 1000 c.ft.) in the net cost of coal as disclosed in the annual accounts ending March 31 in any year, the price of gas for motive power purposes for the following year commencing June 1 following the publication of the accounts will be increased or decreased by 0·2d. per therm (1·0d. per 1000 c.ft.).

(2) Should the cost of manufacturing and supplying gas be increased through any contingencies beyond the control of the Corporation (such as fire, accidents, war, explosion, fog, strikes, lock-outs, and the like), the price of gas may be increased.

(3) Accounts will be rendered monthly, and discount will only be allowed if payment is made by the end of the month following the month of consumption.

We are informed by Mr. C. R. Ingham, the Engineer and Manager to the Brighouse Gas Department, that since this new power rate came into force the gas consumption for power purposes has doubled.

THE NEWS—continued.

British Benzol and Coal Distillation.

The Board of British Benzol and Coal Distillation reports that since operations began on Dec. 5, 1929, the ovens have proved completely satisfactory. The most serious difficulty is the fall in the contract price of coke during the past seven months, due to the unprecedented conditions in the iron and steel trades.

Notwithstanding these difficulties the trading results from Oct. 31, 1929, the date upon which the published accounts were made up, to June 30, 1930 (eight months), show a small balance of profit, after providing for all overhead charges, including Directors' fees and bank interest, but before providing for depreciation and amortization charges.

With regard to a debenture issue, underwriters state that, owing to heavy financial commitments recently undertaken, they are unable to agree to extend their agreement, and the Directors are negotiating with the Company's bankers for a continuance of the existing facilities.

Notes from Scotland.

Cupar Gas Company Has a Good Year.

Hon. Sheriff Stark, who presided at the annual meeting of Cupar Gas Company, Ltd., said the report showed very clearly that they had had a remarkably good year. The consumption of gas and the revenue had gone up notwithstanding the fact that for the first time in the history of the gas-works they had had formidable opposition in the introduction of electricity in the town.

The Cupar Gas Company had never been in a more satisfactory state than it was to-day. Recently at their centenary celebration they had had representatives from gas undertakings all over the country, including Sir Arthur Duckham, all of whom had testified to the very efficient manner in which gas was produced at Cupar. That, said the Chairman, was largely due to the very efficient and intelligent management of their Manager, Mr. Jas. Macpherson.

He moved the adoption of the report, which was seconded by ex-Bailie R. Dott Thomson.

Mr. T. L. Brown moved the declaration of dividends on the ordinary and preference stock, the former 8¾ p.ct., and the latter 5 p.ct., both tax free.

Hon. Sheriff Honeyman said that electric light in Cupar was in the initial stage at present, and that there would be more opposition than they had experienced so far. His advice was to build up a strong reserve.

Hon. Sheriff Stark said they were doing well by the consumers when they sold gas for 3s. 9d. per 1000 c.ft., with considerable concessions to commercial users.

A Dividend of 10 P.Ct., free of income-tax, was declared at the annual meeting of Huntly Gas Company; and the Directors of the Elie and Earlsferry Gas Company, Ltd., have declared a dividend of 6 p.ct., free of income-tax.

A Profit of £1384 was announced at the annual general meeting of Bo'ness Gas Light Company, Ltd., when it was decided to declare a dividend of 8 p.ct., free of income-tax, and carry a sum of £200 to reserve. A reduction in price of gas to ordinary consumers of 1½d. per 1000 c.ft. was reported by the Gas Manager, making the rate 3s. 11½d.

At the General Meeting of the Stevenston Gas Company, the Directors reported that after making the usual allowances for depreciation, the balance at the credit of the profit and loss account was £1234, and recommended that this should be applied in paying a dividend of 7½ p.ct., free of income-tax amounting to £1200, and in carrying forward to next year £34. The total gas make during the year amounted to 32,830,520 c.ft.

Corporation Undertakings' Results.

Bexhill.

The annual report of the Bexhill Corporation Gas Committee shows that during the year ended March 31 last there was a loss on the undertaking amounting to £665. This compares with a profit of £2368 in the previous financial year.

Coventry.

The accounts show that the total income increased £8924 over last year. The increase from the sale of gas was £17,858; but residual products were £10,575 lower. There was an increase of £4740 in the cost of the manufacture of gas, largely due to the increased cost of coal, and also an increase of £12,751 for rates due to the re-assessment of the undertaking. The gross profit carried to the net revenue account was £92,297, as compared with £102,671 last year. The net profit amounted to £748, as compared with £1424. The total cost per 1000 c.ft. of gas sold was 37·84d., as compared with 37·03d. The fall in revenue from residuals caused an increase in cost of 1·62d. per 1000 c.ft. During the year £89,380 was borrowed for various developments. The capital account shows £87,840 spent, £14,185 being provided out of revenue. £30,028 was expended on new mains and service pipes, £7028 being met from revenue.

Lancaster.

The annual report of the Lancaster Gas Department shows receipts of £83,728 and expenditure of £62,618, a gross profit of £21,110. Income-tax and capital charges absorbed £11,993, leaving a net profit of £9117. Of this £1101 was expended on new mains, meters, and services; £2000 went to the relief of rates, and the balance was placed to the Appropriation Fund, which amounts to £11,200, while the reserve fund balance is £12,525. The Engineer and Manager (Mr. G. Dixon) recommended that an amount equal to 9d. per ton of coal carbonized should go to a special renewals fund account to meet the cost of rebuilding the brickwork of the ovens. Coal cost £26,512, averaging 20s. 9·9d. per ton, against 20s. 9·2d. last year. Residuals realized £12,469, or 47 p.ct. of the total cost of coal, against 54·6 p.ct. last year and 66 p.ct. in 1929. The average price for gas per 1000 c.ft. sold was 3s. 0·69d.

The working results showed a yield of gas of 15,400 c.ft. per ton of coal. The increase of gas sales amounted to over 6 p.ct., or 24,000,000 c.ft. Leakage had been reduced from 5·8 p.ct. to 3·72 p.ct.

Macclesfield.

There has been an increase in the consumption of gas amounting to 67,312 therms, which is 4·58 p.ct. above last year's figures. The prepayment system now amounts to 49·16 p.ct. of the whole consumption, and shows an increase of 12·24 p.ct. above last year's consumption.

The unaccounted-for gas was 5·49 p.ct.

After paying £3499 towards the interest and sinking fund, the net profit for the year was £318. The number of cookers, gas fires, radiators, boilers, &c., sold or let out on hire purchase during the year was 774 against 648 last year. During the year 136 new service pipes were laid and new meters fixed; the total number of meters in use at the end of the year being 10,602—an increase of 83 on the previous year.

Nottingham.

Alderman Sir Albert Ball, Chairman of the Nottingham Corporation Gas Committee, in moving the adoption of the annual report of the Gas Committee, a summary of which has been already published in these columns, said that the Department had paid £63,928 in rates and taxes on the year's work, equivalent practically to 5d. per 1000 c.ft. of the gas sold. Their difficulties last year had arisen mainly through the low prices of residuals. Twenty years ago, he said, the income from sulphate of ammonia represented 2d. per 1000 c.ft. To-day, however, it only represented a ½d. Tar and tar product receipts had dwindled, the sum received last year being £2711 less than in the previous year. The total indebtedness of the undertaking was £854,216, and the liquid assets £910,472, leaving a clear surplus of £56,254, *plus* debts due to the Department of £118,944. The total surplus was thus £175,918, *plus* the freehold, plant, over 100,000 gas meters, and 150,000 gas cookers and stoves.

Alderman W. Halls, Vice-Chairman of the Corporation Electricity Committee, congratulated Sir Albert Ball and members of the Gas Committee upon having set such a splendid example of municipal enterprise.

The report was adopted

Skipton.

A net profit of £2119 on the past year's working of the Gas Department was reported to Skipton Urban District Council. The credit balance of the Undertaking thus stood at £14,309, and the Council decided to transfer a further £3000 to reserve fund. The price of gas had been reduced by 3d. per 1000 c.ft. as from the June quarter of last year, and a further reduction by 6d. per 1000 c.ft. as from January this year was given to the consumers at Gargrave. The Committee could not make a definite promise of further reduction at present.

Wallasey.

The financial result of the year's working is a gross profit of £38,750 and a net profit of £7379 after the due payment of loan charges and income-tax. The total expenditure during the year has been £191,679, and the income has been £199,058. The increased expenditure is chiefly due to the higher cost of coal, and to the payment of over £4000 extra for rates owing to the recent increase in the assessment of the undertaking. The price of gas throughout the year to ordinary consumers was 7·66d. per therm (equivalent to 3s. per 1000 c.ft.), less 5 p.ct. discount for prompt payment, making a net price of 7·28d. per therm. The gas produced during the year amounted to 1,007,620,000 c.ft., and the quantity of gas sold was 933,167,000 c.ft., against 949,118,000 c.ft. the previous year—a decrease of 1·68 p.ct. A total of 1350 gas appliances were sold through the three showrooms.

Two-Part Charging—Policy and Practice. . .

In which "Casuist" maintains that our industry should now try to co-ordinate its views on present policy, at the same time intensifying its efforts to secure freedom on gas pricing. Nothing is lost, he says, by publicity on things needed.

Many people are writing and talking about reformed gas pricing, but we do not seem to get much "forrarder." We are in the midst of a veritable Babel, with no visible Esperantist who can bring something like order from the chaos that reigns. Fewer people are actually trying out experiments in revised gas pricing, but whether these experiments can yet be regarded as true "reform" is problematical, for the methods employed are diverse, and emulators of any or all of them are comparatively small in number compared with the total number of undertakings which sell gas.

It is not good for any industry to be left guessing as to which way its future policy lies, or what steps it should take to ensure the realization of that policy. While our leaders have declared that the gas industry needs, and must have, the same measure of liberty in pricing as is enjoyed by the electrical industry, they are either short of the "will to achieve" or are faced with opposition which paralyses all efforts to make headway. It is five years ago—July 14, 1925, to be exact—that a Committee was appointed by the Central Executive Board of the National Gas Council "to consider the question of differential prices for gas—viz., discounts for gas supplied in large quantities or for special uses such as power purposes, and whether dividends of sliding-scale companies might properly be calculated upon the average price received for gas." To-day, sliding-scale companies are apparently as far off calculating dividends on the average price as in 1925, although, in an interim report issued a year later (July 9, 1926) the opinion was expressed that this alteration of the existing law was essential.

A Retrospective Summary.

When the interim report was considered, the Committee were directed to proceed to the consideration of methods of charge other than the flat-rate system. There was then only one British undertaking (Halifax) which has adopted an alternative (two part) system of charge. A voluminous report was issued to members of the N.G.C. in March, 1928, and was thereafter considered; and the principal of its conclusions were approved by the District Executive Boards. Tribute has been paid to the painstaking work of the Committee, which provided for the benefit of the whole industry a mass of detail, in which achievement they were greatly helped by information assembled by Mr. George Evetts in America, where the flat-rate system of charging had already come to be regarded as obsolete.

Shortly after the issue of this report, a Joint Parliamentary Committee which considered Bills promoted by the South Suburban and Dover Gas Companies approved the continuance of the basic price and basic dividend system, under which no limitation is placed in regard to methods of gas pricing. It was then felt within the industry that the door was opened to much wider flexibility in gas pricing in the case of undertakings with the basic system; but as no definite official pronouncement has since appeared on this "open door," and as, in any case, it would mean individual applications by Act or Order to be put on the basic system by those not now in possession of these powers, this way of reform is not likely to produce quick results such as might be expected from a general emancipating Act.

At the B.C.G.A. conference held in York, Oct. 24 last, the subject of gas charges was discussed in private session, and there was a consensus of opinion that the industry should have greater freedom, though no resolutions were submitted embodying that view. In January, 1929, the Second Report of the National Fuel and Power Committee appeared. That report mainly concerns a memorandum prepared by the National Gas Council as far back as July, 1926, and submitted at that time to the Board of Trade. In this memorandum the need for greater elasticity in charging was stressed, and the elements of two-part or three-part tariffs explained. Among many other reforms in gas legislation supported by the National Fuel and Power Committee was the power to introduce a two-part tariff as an alternative method of charge. The report said that "If the Board of Trade are authorized to sanction the introduction of two-part tariff systems, due regard should be had by them to the necessity of affording sufficient protection for small consumers."

The National Fuel and Power Committee's Report was rightly regarded as a valuable instrument brought to the aid of the gas industry in its struggle for freedom. Unfortunately, it came too late to stand any chance of statutory adoption in the Gas Undertakings Act, which took effect on May 10, 1929. Indeed, so congested was Parliamentary business in the early months of last year that it was only by the "skin of its teeth" that even this modest payment on account of the "bill of redemption" passed into law.

A Few Words About Parliamentary Congestion.

From the beginning of 1929 to the present day the subject of gas pricing has mainly switched back to the individual sphere from which it first emerged, and no visible progress has been registered in the campaign for general emancipation. There seems to be a feeling in some quarters that this is due to indifference in our national organizations and those who guide them. It is here submitted that there is not a particle of justification for that assumption. Anyone who follows the deliberations in Parliament can see how hopelessly and increasingly it has gravitated into a huge "talkie," where personal ambitions and party intrigue take precedence over the urgent needs of a nation labouring in the toils of industrial bewilderment. If we could have more of the "movie" and less of the "talkie" the gas industry might have some early prospect of redress, but what is the good of "kicking against the pricks?" Still more pertinently, what is the good of "baiting" our leaders when they realize, as any normal observer may realize, that in a Parliament constituted as is the present one any plea for consideration towards the gas industry is hopeless? Such tactics, with less discretion or prudence in the right place, might easily stampede our leaders into action which would do more harm than good. In a B.B.C. talk on July 23, Mrs. Sydney Webb, taking Parliamentary congestion as the subject of her discourse, advocated a separate Parliament for purely home affairs as a means of expediting the business of conducting national affairs. As her husband is a Cabinet Minister, this proposal may be taken as an indication that in the inner circles of Government the ability of the Parliamentary "machine" to effect a satisfactory output to meet modern demands is regarded as impossible.

Apart from congestion, Parliament has little sense of proportion. Think of the number of days and the eloquence which have been lavished on the Coal Mines Bill—a measure which, at best, is damned with faint praise by its greatest supporters. Those who clamour most insistently for fresh legislation are most likely to get it, but to be certain that it is of the right kind and according to their desires they must first have a preponderance of the general electorate behind them. How stands the gas industry in this? We see in the conclusions of the N.G.C.'s Committee on Gas Pricing that an educational publicity campaign is advocated whereby the majority of customers can be brought to see the advantages of a new system of charging. If the National Gas Council is arraigned for not taking sufficient steps in that regard, the responsibility must fall chiefly on the general body of members, for in this, as in Parliamentary matters, it is the will of the majority that must prevail—and "will" is something more than mere passive acquiescence. When the country was in the throes of a general election in May, 1929, an exhortation was sent to all members of the N.G.C. to seek a pledge from candidates that they would urge the Government to introduce legislation which would facilitate joint working and co-operation between gas undertakings and would give them the same

elasticity in their methods of charge as are enjoyed to-day by electricity supply undertakings. It would be interesting to know what proportion of members responded to that request.

Reformed Pricing Needs Enthusiasm.

Before members of Parliament in sufficient numbers can be counted on to support revised gas legislation, there must be assurance that the electors, which, at a rough approximation, is the same thing as gas consumers, are in favour of the reforms sought, and particularly in such a matter as that of gas pricing. Before the electors (*i.e.*, the consumers) are asked for support there must be whole-hearted enthusiasm within the industry itself for the CAUSE. There may be the requisite degree of enthusiasm within the industry, but, if so, it is not very obtrusive. If the CAUSE is good, there is no need to hide its light under a bushel. How many undertakings have yet sought to educate their consumers on reformed gas pricing?

Having completely satisfied itself that it really wants greater flexibility in gas pricing, one of the first things the industry needs is a Propaganda Committee with a whole-time Controller and staff to concentrate on this single item of gas publicity, going to the limits, if need be, of circularizing every elector—or preferably arranging a personal canvass by the staffs of individual gas undertakings. Every gas employee should be enrolled in the cause of seeing that gas has a fairer showing in Parliament. Cabinet Ministers and lesser lights in Parliament only treat the gas industry with indifference, or actively support its chief competitor, because they are not challenged by the tribunal which they fear most—the common electorate.

One thing that makes a united front more difficult is the intermixing of local authority with company undertakings. The first are subjected increasingly to political influences, and those who control them, whether officials or members of the gas committee, have to "gang warily." Too much, therefore, cannot be expected of them from the propagandist standpoint. But we have still a big majority of company undertakings, 455 (statutory), against 319 local authorities, the companies selling (1928) 180,890 million c.ft., against 101,539 millions, and having 5,423,259 consumers, against 3,478,006. If the companies alone acted in unison and developed such a co-operative feeling with their consumers as could be converted to terms of mass pressure on local members of Parliament, the Government of the day would not be quite so cynically indifferent to the claims of gas for "a place in the sun" as the present and its immediately preceding one have been. This aspect is only elaborated because the ordinary channels of representation to leading members of a Government or heads of Departments are apparently so impotent as to need reinforcement from a source which can command attention.

It does not appear within the realm of practicability for the gas industry to have its own direct representatives sitting in Parliament as is the case of the Miners' Federation and other trade unions. The next best thing is to find means of inoculating those who do get to Westminster with an effective injection from the phial labelled "Gas Consumers' Interest." It hardly needs stressing that before consumers will respond to an invitation to co-operate they will first have to feel the effects of inoculation from "Good Service." If gas undertakings generally have been assiduous in applying this invigorator, the prescription for which is plastered all over technical contributions, &c., on "How to treat the consumer," there should be nothing wanting here. If any are still negligent, and it is no part of this article to say they are, repentance cannot begin too soon.

Opinions on Pricing at Variance—A Lead Required.

Earlier on it was said that the subject of gas pricing had switched back to the individual sphere. Putting this more explicitly, it means that, where there is silence on the general front, individual undertakings in many cases are actively exploring the subject of pricing to see if new methods can be employed, and, if so, what system will best suit their conditions. Quite an appreciable number—mostly local authority undertakings—have put into force revised pricing. But there is no consensus of opinion as to which is the best system to employ. Discussions on the subject show considerable diversity of ideas. Meanwhile, the electrical industry is striving by might and main to increase the number of patrons who pay a fixed charge per quarter for "service," and take the "commodity" at a low charge per unit. The chief aim of the gas industry must be to counter that form of competition; and the fact that two-part charging is rapidly extending in the electricity sphere is good evidence that it is appreciated by the public. It undoubtedly induces bigger usage of current, and gives suppliers a potent weapon in their declared intention of capturing big business in the cooking, heating, and hot-water fields.

Is it not time the gas industry brought its ideas into closer concordance? One of the points in the conclusions reached by the Committee on Gas Pricing was that undertakings should retain their freedom to impose what system of pricing they thought fit—*i.e.*, no system should be foisted upon them either by Parliament or by "dictation" from any external source. Individual freedom is all very well, but it has the unfortunate effect in the gas industry in this matter of two-part or other new pricing that in the diversity of ideas we fiddle while Rome burns. We cannot wait until a new Gas Act gets on the Statute Book before securing clarity of idea as to what the industry can and will do within its present powers, or what it will do when the measure, possibly ten years hence, comes into force. A lead is required which will expedite reformed pricing within present permissibility; and the National Gas Council will do well to take that aspect earnestly and quickly into consideration.

It seems to be widely accepted that local authorities have much greater present freedom to practise flexibility in gas charging than have companies. There is always the unanswerable example of Halifax as to the benefits to be derived from dividing charges into two parts—fixed for standing charges, and movable for quantity of gas used. One or two have followed the Halifax example, though with a different way of determining the fixed portion of the charge; more have adopted the "block" system. It would give tremendous impetus to reformed gas pricing if all local authorities could be induced to follow these examples, and incidentally it would greatly help the CAUSE of inducing Parliament to apply amendments of statute which would give companies corresponding liberty. It is useful in its way for individuals, as Mr. W. B. McLusky has so indefatigably and ceaselessly done, to labour as missionaries, but it would be vastly more productive of results if the National Gas Council were to take an energetic hand in this part of the work.

It is only in post-war years that the electrical industry has cast longing eyes on the artizan's dwelling as a means of increasing the sale of current. The opportunity to satisfy the desire came with the advent of municipal housing and the subsidization therefor from national funds. That feature need not be elaborated here; its pros and cons are generally known, and now form subject of representation against the pernicious practices by which some local authorities controlling housing schemes and also owning the electricity supply undertaking say to municipal tenants, "Thou shalt not have gas," or "Thou shalt only use gas for, &c." Even if the gas industry is successful in having this sort of autocracy prohibited, the fact remains that electricity has invaded to a substantial degree a domain which it was believed not many years ago gas would continue to hold without challenge. This fact has to be borne in mind in any consideration of amending the present system of gas pricing.

The Unremunerative Consumer.

From sundry sources statements have been made that, on an analysis of production costs showing the amount of standing charges, this or that percentage of consumers were found to be getting their gas at less than cost, with the result that bigger consumers were paying more for gas than, in an equitable distribution of charges, they would be doing. These statements are sometimes accompanied by the qualification that it is not always the "poor" consumer that is unremunerative, taking that as meaning the rank and file householder-workmen. With the consumer who keeps on a gas supply purely as a convenient alternative to electricity when it evinces one of its characteristic failures there can be little sympathy; but the industry will have to go very gingerly in regard to those users who are "all-gas," yet whose accounts, from sheer necessity or prudent thrift, are considered to be below the Plimsoll line of remunerativeness.

At the end of 1928, statutory gas undertakings supplied through slot meters no fewer than 4,968,621 consumers out of a total of 8,901,271, or nearly 56 p.ct. In addition there would be a considerable number of small users supplied through ordinary meters. Actually through slot meters the industry sold 36 p.ct. of the total output in 1928. The best way to bring those consumers who are unremunerative to a state of profit-bearing is, where possible, to get them to use more gas, rather than to increase present charges. In discussions on two-part charging, one thing appears to have almost totally escaped attention. It is that in considering new methods of charging regard must be paid not only to the cost of supplying gas to individual consumers, but to the effect which the loss of such consumers would have upon producing costs. All the capital value for their supply has been expended—mains, service, meter, and sometimes internal fittings. No compensation will be forthcoming if these are thrown out of action—the main partly, and the meter, service, &c., totally.

It appears to the writer utterly fallacious to get out the aggregate of standing charges, as some do, and divide them by the number of consumers as showing what the individual "service" payment by consumers shall be. That means that the big user with a big service gets off with the same charge as the small consumer with a smaller service.

About Compulsory Charging.

It seems clear that for a long time the gas industry will have to be content with introducing two-part charging as an *option* to flat-rate pricing, as is done in Halifax and elsewhere. There appears no example of the two-part system having yet been

made compulsory in Britain. Though the Committee on Gas Charges held the view that gas undertakings should be authorized to make the new system obligatory (as in America), it will be a long time, with the most energetic advocacy, before consumers in Britain will be induced to take kindly to compulsion. But that should not deter the movement for power to apply two-part charging by voluntary acceptance, and especially as a system is badly needed that will enable a consumer, as his use of gas rises, to get it at a lower price. The block system, whereby " parcels " of gas are supplied at progressive reductions as the quantity taken increases, does something to meet this, but it has neither the refinement nor the fascination of the two-part system, which (as with electricity) makes a commodity appear to cost actually lower than it does.

It may be taken for granted that, unless it induced bigger gas usage, voluntary two-part charging would not pay. Those consumers who needed big quantities would go on the system, and so secure a lower over-all price, while those who used small quantities would remain on the flat-rate system. But the lesson of Halifax is that the system does pay; and that is the experience of the electrical industry, or they would surely persevere with it no longer. In other words, two-part charging is an instrument for inviting and securing increased consumption.

The electrical industry hopes by two-part charging to make bigger inroads into the gas business. They hope to get a bigger heating load, and the gas industry should see in the system a means of turning the tables by offering this inducement to consumers to retain gas for lighting, since by so doing they get it (*plus* their gas heating) at the lowest possible price, and, as with electricity users, are themselves the arbiters of what over-all price they should pay.

These observations have for their chief object to show cause why the industry should now try to co-ordinate its views on *present* policy, while at the same time intensifying its efforts to secure freedom on gas pricing. In both these phases something is lacking, but it is not the writer's view that an indictment can be laid against our Executive Committees and their officials, who are more progressive than the mass of those they represent. Rather does he take the view that nothing is lost by publicity on things needed, and therefore has recourse to the columns of the " GAS JOURNAL " for submitting that from now onwards the treatment of this subject should concentrate upon constructive co-ordinated practice, to which end a specific lead from headquarters will be a great help.

INDUSTRIAL EFFLUENT

In which LESLIE F. STEMP discusses the recommendations contained in the Second Report of the Joint Advisory Committee on River Pollution.

Whatever may be thought of many of its recommendations, the Second Report of the Joint Advisory Committee on River Pollution is at least to be welcomed as an indication of the growing appreciation of the difficulties which beset industry with regard to the disposal of industrial effluent.

In dealing with this question, " Industrialist " may be divided under two main headings:

(1) Those who abstract water from streams for use in their industrial processes;

(2) Those who produce a liquid effluent as a result of their manufacture or carbonization.

It cannot be said that the interests of these two types are in all respects identical; for whereas those who fall under the first heading require chiefly that water abstracted should be returned to the stream from which it was taken, those embraced in the second class desire that the fullest access should be given to the sewers as the means of disposing of their trade waste.

The gas industry, of course, ranks among the latter class, and shares the feelings of other traders similarly situated that the present legal position regarding their rights over the sewers is the reverse of satisfactory. This position may be thus briefly summarized:

After prolonged discussion it has now been finally established by the House of Lords that sanitary authorities are not under an absolute obligation to receive manufacturers' effluent into the sewers. Such limited obligation as exists upon them in this respect arises from the Rivers Pollution Prevention Act, 1876, which provides that sanitary authorities shall " give facilities for enabling manufacturers within their district to carry liquids proceeding from their factories or manufacturing processes into such sewers."

The obligation is qualified by two main provisos which in effect greatly restrict its utility. In the first place, nothing may be discharged into the sewers by which such sewers or sewage might be prejudicially affected. Having regard to the fact that the law has laid it down that the term " sewers " include the bacteriological beds, it will be readily appreciated that each improvement in purification methods affords the sanitary authority an opportunity to contend that any particular effluent is prejudicial.

The second qualification to the obligation of sanitary authorities is that no facilities need be given to traders if the capacity of the sewers is only adequate for domestic sewage.

This point is one of great importance in an age in which the erection of large housing estates is a characteristic feature. Each such estate makes an additional claim on the capacity of the sewerage system, and may lead to an exclusion of industrial effluent on the ground that the sewers are no longer adequate to receive it. When the position is thus surveyed, it can scarcely be denied that the main recommendation of the Joint Committee is a step in the right direction.

The whole of the Report of the Committee is based upon the recommendation that the trader shall, subject to the other provisions of the report, be entitled as of right to discharge into the sewers, and the sanitary authorities shall be under a corresponding obligation to receive his trade effluent.

The report outlines a certain machinery for the achievement of this end, of which the main feature is the calling of a meeting on the initiative either of the local authority or of any traders of the district for the purpose of drafting regulations relating to the method, manner, and conditions of discharge. All such regulations would have to be agreed between the local authority and representative bodies of traders, and in default of agreement either party might appeal to the Ministry of Health. It is felt by a number of traders that an appeal to the Ministry—which commands a large staff of chemists expert in such matters—would be preferable to recourse to an individual arbitrator.

No doubt the question of greatest interest and dispute in the drafting of such regulations will be whether any, and if so what, charge may be made by the local authority.

It should be emphasized that the report nowhere recommends the imposition of any charge, although, having regard to the fact that additional obligations are to be placed upon sanitary authorities, it envisages that in some cases the possibility of the question of charge may arise.

No charge could be made except by agreement with the trader subject to an appeal to the Ministry, and where written agreements for valuable consideration are already in existence these will be maintained.

Discussions regarding charge would—in the opinion of the Joint Committee—be based upon " the nature of the effluent, the preliminary treatment given to it, and the total expenditure involved."

It is the general feeling that where reasonable preliminary treatment is given and the local authority is involved in no additional expenditure, traders will not be disposed to agree to the payment of any charge. It will no doubt be considered that the Joint Committee have acted wisely in refraining from making any general recommendations regarding this aspect of the case, leaving it for local determination according to the facts and circumstances prevailing in any particular district.

In such discussions gas undertakings will probably emphasize not only the substantial contributions they invariably make to the rates, but also the fact that they are under an obligation by statute to supply gas, and thereby some liquid effluent is necessarily produced.

There seems little prospect that Parliament will—at any rate in the near future—have sufficient time at its disposal for general legislation upon this matter. It may be, however, that local authorities will, more frequently than in the past, incorporate provisions regarding effluent disposal in their Private Acts. Traders will, no doubt, scrutinize such provisions with care, and wherever possible communicate with their National Organizations thereon.

THE RHINE AND WESTPHALIA . . .

An Excursion in connection with the World Power Conference described by M. Barash, M.Sc. (Tech.), F.I.C. (West's Gas Improvement Company, Ltd.)

Participants in the Second World Power Conference were afforded a unique opportunity of visiting modern superpower stations and all types of large industrial works, so as to obtain a picture of German creative genius and industrial activity. The Managing Bureau of the Conference, in conjunction with the Official Travel Bureau of the associated international travel organizations, prepared and arranged a series of excursions and tours designed so as to include places of technical interest while passing through some of the most beautiful scenery of Germany. One of these excursions was from Berlin westwards to the industrial regions of the Rhine and Westphalia, and in the course of this, visits were arranged to bituminous collieries and coking plants, iron and steel works, gas-works, long-distance gas supply plants, lignite mines and briquetting works, pump-fed storage plants, chemical works, technical colleges, and research institutions.

Leaving Berlin by train on the morning of June 26 the party, numbering nearly 150, arrived at Helmstedt and after lunch visited the lignite mines, briquetting works, and low-temperature carbonization plant of the Braunschweigische Kohlenbergwerke A.-G. (Brunswick Coal Mining Company). Here, in the most westerly of the Central German brown coal mines, are two great open workings producing some 4 million tons of lignite annually. The coal is raised by means of electrically operated dredgers into two chain railways from two seams together 30 m. thick, lying under an overlay of 55 m. of rubble and separated by a layer of sand and clay about 12 m. thick. The lignite is screened, that over 10 mm. is sold directly to industrial consumers, while the screenings are sent by rail to the briquette works. At the latter (with an output of 750,000 tons of briquettes annually) the fine coal is dried from 50 p.ct. down to 15 p.ct. of water in steam-heated drums, and compressed into briquettes in a battery of 33 presses working at a pressure of 1500 atm. and without addition of agglutinant. We were informed that the power required for the whole of these processes is produced at the adjacent power station at Harbke consuming about 10 p.ct. of the lignite production of the mines, delivered direct from the workings by means of a band conveyor.

At Harbke we were also shown over the " Seidenschnur-Pape " low-temperature distillation plant* dealing with 120 tons of lignite per day. The screened raw lignite is dried down to 35 p.ct. water content by means of steam, pressed into egg briquettes (of about 30 gm. each), and these are then slowly dried in a huge enclosed metallic band conveyor down to 10 p.ct. moisture content. Distillation is then effected in a vertical retort heated internally to 400° to 500° C. by means of combustion gases produced partially from a generator fed with part of the resultant coke. The gases from the retort are cooled, washed with paraffin oil to recover all tar oils and paraffin, and are then burned with a regulated amount of air in a combustion chamber to supply heat for the carbonizing and drying processes. The tar recovered has a high paraffin content (about 15 p.ct.) and a melting-point of 42-43° C. Of the coke (or char) produced, a portion is used to augment the gas as fuel for the distillation process, and the remainder is ground, mixed with water (up to 25 p.ct.) and re-briquetted for sale as a domestic fuel, for water gas generation and as an industrial fuel.

The evening and the following morning were spent at Brunswick. After lunch we were conveyed by motor coach via the beautiful thousand-year-old Imperial city of Goslar into the pine-clad, storm-swept Harz Mountains to Clauthal-Zellerfeld, where the famous Mining Academy was visited. Later the journey was continued to Hildesheim, where the night was spent, after a reception and dinner in the " Ratsweinkeller " (the Town Hall wine cellars).

On June 28 we were received at Essen, and entertained at their residence, the magnificent " Villa Hügel," by Herr Krupp and his wife, Frau Bertha, who will go down to posterity in connection with the " Big Bertha " which was named after her during the war. Because of its industrial importance and the number of visits arranged, three days were spent in Essen.

* See Proceedings of the Second International Conference on Bituminous Coal, November, 1928, Vol. I.

On the first morning (Sunday, June 29), the party was conveyed by motor-coach to the " Pumpspeicher-Kraftwerke Herdecke " (Herdecke pump-fed-accumulator power works). Here a huge artificial reservoir has been constructed to hold 1·5 million cub.m. of water, from which pipes 2·55 m. in diameter fall to immense turbines generating power for the Rheinisch-Westfälisches Elektrizitätswerk A.-G. The water is returned to the reservoir by three of the largest electrically-operated pumps in the world, during off-load periods (particularly at night), so that the turbines are operating practically at full load continuously; and we were told that an over-all efficiency of 62 p.ct. energy production is attained.

For the visits in and around Essen, a booklet was prepared and distributed by the Federation of technical and industrial organizations of Essen. The booklet described and illustrated the works of some fifteen of the largest organizations in this industrial centre, and it was a difficult matter to decide individually how best to utilize the two available days in view of such an attractive and varied programme. Selections having finally been made, six parties set out on Monday morning, June 30, to visit mines, coke ovens, power stations, Krupp's steel works, foundries, and rolling mills, &c., in the neighbourhood. The writer's party inspected the Recklinghausen collieries (fat, lean, and coking coals) and power plants, the huge gas-engine power installation of Bergmannsglück, and the Scholven coke ovens and nitrogen fixation plant, controlled by the Bergwerks A.G. Recklinghausen, in the industrial centre of Gelsenkirchen-Buer, " the Town of a Thousand Fires." Brief reference can only be made to a few of the more outstanding features of these visits.

Particularly noteworthy are the methods of utilizing the coke oven gases at these installations. At Bergmannsglück, some 12,800 KW. are produced hourly by generators driven by six tandem gas engines and one twin-tandem gas engine, each of 1250 mm. cylinder diameter and 1300 mm. stroke, and each consuming some 2000 to 3000 cub.m. of gas per hour. The machines work at present on gas of about 450 B.Th.U. per c.ft., while, when the nitrogen fixation plant is working (utilizing the hydrogen from the coke oven gas) they will be supplied with the residual gases at a C.V. of about 600 B.Th.U. per c.ft.

Steam is raised at this works by waste-heat boilers utilizing the exhaust gases of the gas engines and the cooling water of the cylinders. In 1929 the electrical production of this installation amounted to nearly 70 million KW.-hours, and the steam produced from waste-heat per KW.-hour generated was 1·25 kg. at 12·5 atm. and 360° C. superheat, while the cylinder cooling water was responsible for 0·70 kg. at 0·4 atm. (dry saturated).

On the following morning, Tuesday, July 1, from among nine possible visits including several steel works and rolling mills, the Bochum College of Mining, the Duisberg-Ruhrort Docks, the Wesel-Datteln Canal (for heavy shipping), the Duisberg-Meiderich tar refinery, and a tour of the town and industries of Düsseldorf, we chose the visit to the Friedrich-Alfred Works of Krupp, at Rheinhausen, the largest and most modern iron and steel works on the Continent. Here were inspected the private harbour on the Rhine, the twelve blast furnaces with an annual capacity of nearly 2 million tons of pig iron, the open hearth furnaces, and the six huge basic Bessemer converters, each treating 25 tons of metal per charge every 15 minutes; the huge rolling mills of a capacity of nearly 1½ million tons annually; and what was stated to be the largest structural steel and bridge building shop in the world.

The coke oven plant at these works comprises 175 ovens producing approximately 1700 tons of coke per day, and includes a bye-product recovery plant for tar, sulphate of ammonia, and benzole. Modern gas-engine generators, gas-fired and waste-heat boilers, and steam turbo-generators were also inspected; and one was struck here by the comprehensive installations of all types of indicating and recording instruments.

We arrived in Cologne early in the afternoon. A couple of hours were spent in sight-seeing and a visit to the world famous and beautiful Köln Dom (Cologne Cathedral); a reception was held in the evening at the Terrassen, on the Rhine, at the invitation of Dr. Silverberg, representing the Rhenish brown-coal industries and the Rhenish-Westfälian Electricity Supply

Company. Dr. Silverberg, in his address of welcome, gave a brief outline of the tremendous development of the brown coal industry in Western Germany for the production of power during the last twenty years. At present brown-coal mines are being extensively worked over the 22 miles of fields from 1 to 3½ miles wide running parallel with the left bank of the Rhine and at an average distance of about 8 miles from the river.

Early the following morning, Wednesday, July 2, the whole party were taken to the Capitol Cinema Theatre in Cologne, and shown a most interesting brown-coal film demonstrating the development of the industry from 1549. The extent of the mechanical development of lignite mining may be judged from the fact that the 1928 production was equivalent to approximately 3500 tons per man employed, while the figure for the year 1900 was only 1000. During this period the annual production increased in the area from 5 to 48 million tons, and the men employed from 5000 to 14,000.

In the evening, the members of the party were the guests of the Cologne Municipality at a brilliant reception by the Mayor and Mayoress in the Town Hall.

On Thursday morning, July 3, the party split up into two sections, and while the smaller section departed for Aachen (Aix-la-Chapelle) to visit further electrical works and cokeries in this area, the main section left by train for Bonn, and embarked on one of the Rhine fast steamers for a two-day trip via Coblenz to Wiesbaden.

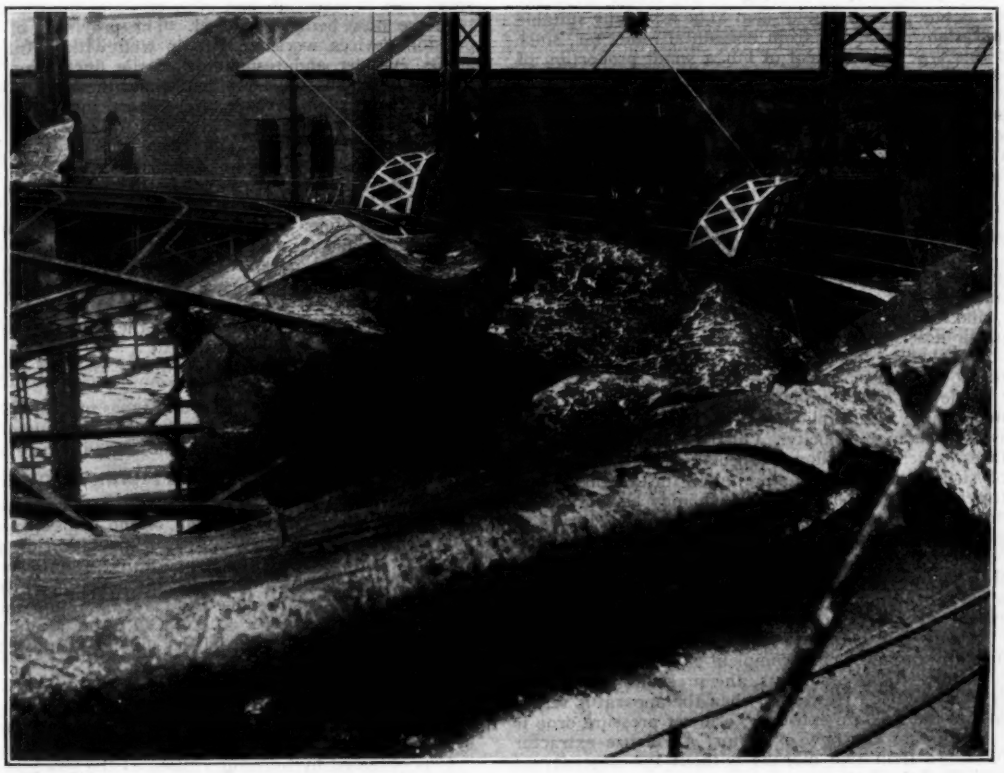
The writer had previously arranged, through the Second World Power Conference Bureau (at Berlin), to inspect the lignite low-temperature carbonization and power plant of the Preussische Elektrizitätswerke A.G. at Wölfersheim, near Frankfurt. Here the moist brown coal, containing 55 p.ct. of water, is broken down to below 10 mm. in size and dried down to 15 p.ct. water content in a series of six rotating tubular drum driers, each of a capacity of 300 tons per 24 hours, by means of waste steam. This dried lignite is then fed continuously down a series of rotating vertical retorts of the "K.V.G." type. Each retort consists of two metal cylinders, the outer one rotating round the inner; the coal passes between the two cylinders, and the inner cylinder is filled with vertical tubes up which pass the flames from the heating gases. Scrapers in the annular retort lead the coal gradually downwards while it is distilled at about 700° C. The distillation gases issuing from the retorts are led to condensers and to Cottrell separators for removing the oils, and then back to the bottom of the retorts where they are burned ordinarily as fuel for the carbonizing process.

The coke or char is discharged from the retorts into inclined, revolving, water-cooled drums, whence it is conveyed to the storage hoppers over the boiler plant.

The pulverized fuel boilers, each fitted with twin pulverizers, produce steam at 35 atm. pressure (500 lb. per sq. in.) which is fed direct to high-pressure turbo-generators. The exhaust from these is led to a set of lower pressure turbo-generators working at 15 atm., and the exhaust steam from these passes to the lignite driers, whence, together with the evaporated moisture, it is pumped back to the high-pressure boilers.

Holder Wrecked at Keighley.

Our photograph shows the results of an accident to one of the holders at the Keighley Gas-Works which happened on July 29 at about 8.10 a.m. There was a sudden roaring kind of noise, Mr. A. Bromley, Engineer and Manager, informs us, and some of the workmen looked out and saw the holder ablaze on the roof and slowly lowering. The Foreman in charge went at once into the valve house and shut the inlet valve; the outlet valve was already closed. The holder then settled into the tank. It was all over in about five minutes. There was about 750,000 c.ft. of gas in the holder at the time. The cause of the accident has not yet been ascertained, but there is no doubt that something gave way in the crown, and created a spark, thereby lighting the gas. No one was injured; and the only other damage done was a pane of glass broken at the back of the office which is about fifteen yards away. Our illustration gives a good idea of the outcome of the accident.



THE "JOURNAL" TECHNICAL RECORD

Which also contains Full Reports of Meetings of Gas and Allied Associations ——

The Fifty-Third Congress of the French Gas Industry

The Fifty-Third Congress of the French Gas Industry was held recently in Paris under the Chairmanship of M. Robert Ellissen, President of the Syndicated Union of the French Gas Industry. In his Presidential Address, M. Ellissen referred to the recently completed joint headquarters of the various institutions connected with the gas and coke industries of France, known as "Maison du Gaz." The building includes also new offices for that well-known publication the "Journal des Usines à Gaz."

As is always the case, the papers and reports presented at the Congress covered a wide range.

TAR DEHYDRATION FOR SMALL GAS-WORKS.

A novel method of continuous tar distillation on a small scale in use at Limoges was described by M. Cabrier. The principle is that of a thermo-syphon and vapour lift. Tar from a reservoir forming the cold limb gravitates to a boiler situated in the hot limb, and the mixture of hot tar and vapours is discharged into a vapour separator situated so that the separated tar drops into a receptacle whence it may be diverted either into the reservoir or to the dehydrated tar collector. Tar fog and heavy vapours are separated in a water cooled conical top from the apex of which the light oil vapours pass to a condenser. The boiler has a capacity of approximately 5 gallons (the fire hazard being therefore negligible), and the throughput of the plant is 2 tons per day when distilling off 7-8 p.ct. of oils. The boiler is heated by waste gases at a temperature of 250° C., and distillation may be assisted by the use of live steam or superheated steam. The process would seem to be especially suitable for the preparation of road tar from horizontal retort tar, since with tar of this type the removal of but a small proportion of oils is necessary.

An ingenious method is used for removing any water which may be discharged with the dehydrated tar and collect on its surface—namely, a self-sealing syphon attached to a hydrometric float. This sinks when any water is present, and immerses the syphon, thus enabling the water to be syphoned off.

A SELF-CLEANING TAR EXTRACTOR.

In present-day high-temperature intermittent carbonizing plant, the Pelouze tar extractors require frequent cleaning. This is ascribed to the fact that the tar fog consists of fluid portions and of very heavy fractions, which latter are insoluble in the cold, and obstruct the orifices of the bell of the extractor. M. Fourmanoir describes a patented extractor which is placed in front of the Pelouze extractor. As in the Pelouze apparatus, the effect of shock is employed. The essential feature consists of a rotor made up of a number of flat rings placed close together and forming a multiplicity of fine gaps through which the gas passes with high velocity. Opposite the gaps are the shock surfaces which bring down especially the tarry matter which is of such a nature as to prejudice the action of the Pelouze extractor. A scraper device which may be worked by hand at intervals or continuously by automatic means serves to keep the gaps clean. The separated tar which collects in the lower part of the apparatus and is continuously withdrawn by a syphon seal helps in keeping the plant clean owing to the movement of the rotor in it.

The efficiency of the device increases with the velocity of passage of the gas—that is to say, with the pressure drop—and, with a sufficiently high velocity, complete extraction of the tar is possible. Under these conditions, the pressure drop is approximately 3½ in. W.G. However, when the apparatus serves as an adjunct to the Pelouze extractor, a lower pressure drop is adequate. By use of the new extractor, a Pelouze extractor was run for more than two months without the necessity of cleaning the bell of the latter.

GOVERNORS.

Governors are the subject of three papers. M. Dive presents the mathematical theory of governors of the Venturi type, and M. Moreau deals with reducing governors for boosted gas and with retort governors. M. Delahaye advocates boosting the gas with a view to securing an adequate service pressure and the use of reducing governors at the inlet to the consumers' meters.

AUTOMATIC VALVES FOR DISTRICT HOLDERS.

When district holders are supplied from a feeder main, trouble may arise through the defective working of the automatic valves, which may fail to shut off completely. M. Gérard describes a self-lubricating piston valve operated by a rack and pinion attached to a pulley wheel. The wheel is operated by a friction drive from a wire supported from two pulleys and provided at each end with a weight. The heavier weight is situated over a platform on the crown of the holder, the lighter one serving to keep the wire pressing against the control wheel. When the holder is nearly full, the weight above its crown commences to lift, and enables the valve to shut off gradually. When the holder descends, the valve again opens.

The tightness of the piston valve described is stated to be satisfactory. Though fouling is not to be feared, it is desirable to install a large filter on the upstream side, with the object of excluding rust or other foreign matter which might be carried forward by the gas and disturb the working of the valve.

TOWN GAS FOR AUTOMOBILES.

[M. PIGNOT.]

Progress in the use of gas for automobile purposes continues in France. Much has been achieved in the development of light-weight compressed gas cylinders, the use of which for small cars is essential, and alloy steels of the nickel chromium type are now being employed. The provision of suitable expansion devices working equally well with a full and nearly empty cylinder and responding to the fluctuating demands of the engine has been more difficult, and there is scope for further work. As regards carburetters, several new designs are available and are described.

For the next few years, gas will to a large extent be employed in engines designed primarily for use with petrol. This presents but little difficulty, the necessary precautions being (1) to retard the ignition slightly, (2) to narrow slightly the points of the sparking plugs with a view to securing a uniform explosion throughout, and (3) to pay careful attention to the grinding-in of the admission valves. Substitution of gas for petrol involves a slight loss of power; hence the compression ratio should be increased where possible.

The carbon-monoxide content of the exhaust gases from gas motors has been brought down to a very low figure, in some cases to zero; and from the point of view of hygiene gas is markedly superior to petrol.

Illustrations are given of several types of vehicles adapted for running on both gas or petrol, together with data for gas and petrol consumption under comparable conditions.

DETERMINATION OF THE EFFICIENCY OF GAS FIRES.

M. Biard determines the efficiency of gas fires by difference between the heat of combustion of the gas consumed and the heat content of the waste gases. Calculation of the latter involves a knowledge of the temperature, volume, and composition of the waste gas and the specific heats of the constituents.

If 100 c.ft. of gas produce C c.ft. of CO_2, and 100 c.ft. of dry flue gas contain c c.ft. of CO_2, and 1 c.ft. of gas gives rise to V c.ft. of cold dry flue gas under the working conditions,

$$\text{Then } V = \frac{C}{c}$$

To this volume must be added that of the water vapour present in the air and the gas and that arising from the combustion.

C is obtained by burning 2 litres of the gas and determining the carbon dioxide formed by absorption with caustic potash and titration against standard sulphuric acid. Sulphur compounds present in the gas and carbon monoxide arising from incomplete combustion are too low in amount to introduce appreciable errors.

The low concentration of carbon dioxide (about 1 p.ct.) in the flue gas is estimated by passing a measured quantity (1 to 7

c.ft.) of the gas through a train of potash flasks at the rate of approximately 1 c.ft. per hour.

The relative amounts of radiated and convected heat are determined by first obtaining their sum in the manner indicated, the amount of convected heat being then obtained by a separate test in which the radiated heat is for the most part eliminated by removing the radiants from the appliance. Strictly speaking, this gives the amount of heat which the radiants enable to be radiated.

The speed with which determinations may be carried out renders it easily possible to prepare curves showing the variation of the efficiency with the rate of gas consumption. With a given consumption of gas, removal of the radiants leads to an increase in the temperature and volume of the waste gases.

The results obtained indicate that the efficiency of output of radiated *plus* convected heat—that is the ratio of this sum to the heat input—shows a maximum value at a definite rate of gas consumption. The statement is made that, with a suitable method of recuperation, an efficiency of 70 p.ct. may be realized without the appearance of carbon monoxide in the combustion products.

The relationship between the volume (cold) of the waste gases and their temperature is shown to follow Péclet's formulæ.

The methods described are applicable to other types of problems also, and there will be universal agreement with the author that the availability of performance data for gas appliances will lead to an extension in gas sales.

"SIGMA" GAS METERS.

M. Echinard, of Bayonne, discusses the advantages which "Sigma" oil-filled meters offer over wet meters. These are stated to consist of absence of corrosion troubles, constancy of working, absence of ill effects consequent on exposure to extremes of temperature, ease of reading, and adaptability to overloads and to relatively high pressures. Moreover, operating costs are considerably reduced owing to the absence of need for periodical visits required in the case of wet meters for replenishing the water. A further advantage is the fact that extra revenue from the sale of gas is obtained since higher consumptions are recorded due to consistent accurate measurement. The latter point is readily believable, since faulty meters in the vast majority of cases register in favour of the consumer.

"Sigma" meters are so far available only in sizes up to 20 lights, and the author, in view of his experience, expresses the hope that larger sizes may be developed.

INSTRUMENTS FOR MEASURING THE FLOW OF GAS AND STEAM.

Two new instruments working in conjunction with orifice plates are described by M. Duchêne. The first is a recording and integrating apparatus for steam flow. A differential mercury manometer contains an iron float in one limb which is surrounded by a coil through which an interrupted current is passing. The coil is suspended from counterpoise weights and follows the movement of the float. In its travel it draws a wire over the control wheel of a variable rheostat, thereby altering the current in an external circuit. By suitable choice of the steps of the resistance, it is arranged that the intensity of the current is proportional to the square root of the pressure drop—*i.e.*, to the steam flow. Under these conditions an integrating watt-meter will indicate the total consumption of steam, and an ammeter the rate of flow.

The second instrument is a recording apparatus for gas flow. A differential manometer containing a float from which a soft iron weight hangs is used. The liquid in the manometer may be either water or oil. The part of the limb containing the weight is surrounded by a double-wound coil, one serving to take an alternating current, the other to take up the induced current. The latter is measured by means of a recording ammeter. The farther the weight comes into the field of the coil, the greater is the induced current, and hence, also, the deflection of the ammeter. The apparatus serves also as an amplifier of the pressure difference, since the coil carrying the current exerts an attractive force on the soft iron weight, and hence adds to the effective weight of the float. The apparatus is sensitive to pressure differences as low as $\frac{1}{25}$ in. W.G.

Wire Baking by Gas*

By O. L. Maddux, Industrial Gas Engineer, United Gas and Fuel Company, of Hamilton, Ltd., Hamilton, Ontario.

In a wire mill, before the drawing operations start, it is necessary to clean all of the rods used by dipping in a hot cleaning solution, rinsing thoroughly with cold water, then dipping into a solution of lime. This lime is put on for the purpose of neutralizing all acids that may remain and to assist in keeping the wire free from rust. The lime solution being made up of ordinary quick lime and water has a tendency to rust very rapidly as long as the water remains on the rods. During this process of cleaning there is a certain amount of free hydrogen that enters the steel in the pickling or cleaning solution. This hydrogen has a tendency to make the rods brittle, and unless it is removed breaks will occur as the wire is drawn through the dies. Up to the present time it has been customary as soon as the rods have been dipped in the lime solution to put them in an oven at approximately 250° Fahr., allowing them to remain there for a period of five hours, until the rods are both dry and the hydrogen has been given out. These rods are handled in coils of approximately 5 ft. outside diameter and are placed vertically on a truck, each truck containing sufficient coils to bring the tonnage up to approximately 1600 lbs.

There have been four different methods of firing these ovens:

(1) Radiator pipes in which the hot flue gases from the coal or coke fire are passed under the floor of the oven and sufficient heat radiated up into the oven to obtain the necessary temperature.

(2) Steam coils placed in the oven with sufficient sq. ft. of pipe area to heat the oven to 250°.

(3) Combustion tubes placed around the bottom of the oven, the first 10 ft. of which is lined with brick. Gas or oil and air have been burned along in this and the hot gases allowed to pass through the remaining length of tubes thereby heating the oven to the required temperature.

(4) Electric resistance elements being placed along the bottom on each side of the oven, which in due time bring the oven up to the required temperature, drying out and baking the wire.

Costs were gone into, and it was found that the average cost of labour and fuel for system No. 1 amounted to $1.00 per ton of wire baked, using soft coal at $6.00 per ton; on system No. 2 the H.P. requirements for heating the oven usually brought the cost up to about $1.00 per ton based on steam coal at $6.00; on system No. 3, with gas, the over-all cost was found to be approximately 65 cents per net ton based on manufactured gas at 50 cents per 1000 c.ft. and No. 4 system under electric rate averaging 0.9 cents per K.W.H., the cost figured to 80 cents per net ton, all of which would lead one to believe that the application would be simple by putting a gas combustion tube in the bottom of the oven. It was found, however, in every operation of these plants that were investigated that the first oven charge per day was considerably rusted over an arc of from 60° to 90° at the bottom of each coil of rods and an arc of approximately 30° on each succeeding batch.

After a great deal of consideration we decided that the primary object in removing this condition would be to dry the wire as quickly as possible before an opportunity had arisen for rusting to take place. We accordingly placed an air-heater on top of one of the bakers and from the outlet of this heater put in a 10-in. pipe through the roof, down one side, and along the floor of the oven. This pipe had a series of spouts or jets that directed the air to the bottom of the coils of rods. Along the other side of the oven and toward the back another pipe was put in which had jets arranged to pick up cold air from the floor. This was carried up the side at the entrance of the oven through the roof and forward to the inlet of an exhauster. From the outlet of this exhauster the air was carried to the air heater, giving a re-circulation of the heated air. Openings were placed so that this could be a direct feed instead of re-circulation for the first few minutes of operation. It was found, however, that there was sufficient leakage from the oven itself that this principle was not needed. A thermostat is placed in the oven to prevent the temperature rising above that desired. This thermostat, acting on the gas burners in the air heater, reduces the consumption of gas to approximately 25 p.ct. of the maximum.

It was found through this operation that there was no rusting whatever of the coils of rods, and that they are thoroughly dry in approximately fifteen minutes after placing in the oven, and that the total time otherwise is spent in driving out the hydrogen. This is concluded at the end of three hours and fifteen minutes, giving a total time in the oven 3½ hours instead of 5.

Together with doing a job that is 100 p.ct. perfect, the actual cost of gas is 1575 c.ft. of 520 B.Th.U. gas for five tons of wire, 315 c.ft. per ton representing a cost of 15.75 cents per ton of wire baked. The investment cost in a plant having three bakers handling 4000 tons of rods per year is approximately $3600.00, and the saving is found over electricity, the former fuel, of 61¼ cents per ton, or $2570.00 per year, in addition to having broken pieces that have to be handled as a result of this change in the plant reduced to almost nothing.

* Paper at the annual meeting of the Canadian Gas Association.

American Gas Association's Pipe Joint Research Programme*

By R. M. Conner, Director, Testing Laboratory, American Gas Association, Cleveland, Ohio.

It is estimated that there are about 63,000 miles of cast-iron pipe gas mains laid in the United States, and that the value of this material, conservatively speaking, is around six hundred million dollars. Assuming a total investment of 3000 million dollars in the manufactured gas industry, we find that approximately 20 p.ct. of this sum is tied up in cast-iron pipe. Looking at this subject from another angle, I believe we can conservatively estimate that the average annual leakage from our distribution systems will equal about 7½ p.ct. It is true that, in some of our larger cities, where conscientious leakage elimination campaigns are being carried out, this figure might be reduced somewhat, although in some instances it is considerably higher.

According to our Statistical Department, the total gas output of the manufactured gas industry last year was about 586,000 million c.ft. Of this figure, 7½ p.ct. equals roughly 44,000 million c.ft. and represents an annual loss of fuel which has a sales value, if taken at an average figure, of one dollar per thousand of around forty-two million dollars. If it were possible by some means to reduce this figure by as much as 50 p.ct., a tremendous saving would result each year. In the light of present-day knowledge, this accomplishment does not seem at all impossible of attainment.

I believe it is common knowledge to the majority of your members that the American Gas Association, through its Pipe Joint Research Committee, headed by Mr. O. S. Hagerman, of the American Light and Traction Co., has been carrying out at their Cleveland Laboratory a programme of research on various methods of making and repairing cast-iron pipe joints. This work is under the immediate supervision of Mr. K. R. Knapp, a very able distribution Engineer, formerly with the United Gas Improvement Company, and has been under way for about ten months. Several preliminary reports have already been given on the subject, and the amount of interest shown in it marks it as being one of prime importance to our operating engineers. I believe the only regret that has ever been expressed since this work was begun has been that it was not started many years ago.

In preparing a schedule of tests for new joints, consideration was given to many different theories which had been advanced to explain the cause of leakage from pipe joints. That which seemed the most worthy of investigation was the familiar one that a large part of such leakage is due to underground temperature changes which tend to place the joints alternately in tension and compression. A testing programme was accordingly drawn up to reproduce, as far as possible, such conditions. It was our opinion that even if temperature changes were responsible for only a part of the leakage of joints, the subjecting of a bell and spigot joint to alternate tensions and compressions would give a fair idea of the performance to be expected from it underground.

Tension Test.

The assumption was made at the start that the yearly variation in temperature on a main would be 60° Fahr. The resulting change in length of a pipe for this temperature change was readily calculated. Knowing the cross-sectional area of the pipe wall, it was possible to compute the load which it was necessary to apply to a joint in the testing machine to reproduce the same effect as the temperature change assumed.

During the tension test the load is applied from the head of the machine through two thrust bars upon the face of the bell. This method tends to separate the bell from its spigot, which is supported by a shaft resting on two standards made of quarter sections of 12-in. pipe which are placed upon the table of the testing machine. Any movement of the joint is measured by two indicating dials mounted on either side of the test specimen. In these circumstances three conditions are possible. The joint under investigation may either slip to the full extent of the allowable movement, or no movement may occur, the load being resisted merely by the internal stress within the pipe, or, still further, a combination of the two may exist where partial movement of the joint occurs, and the remaining force is taken up by stresses within the pipe. The last is the most common. After each sample joint has been subjected to the tension test, it was compressed to restore it to its original position, thus reproducing the effect of expansion. During all these examinations a constant air pressure was maintained within the test specimen by means of a small portable air compressor. All joints were recessed slightly below the face of the bell which permitted this space to be filled with water, making it rather simple to detect any leakage which might occur.

Our initial test plans provided for subjecting each sample joint to twenty-five alternate tension and compression tests made with a load equivalent to the internal stress set up within the joint by a variation in temperature of 60° Fahr. This procedure was presumed to simulate the effect of temperature changes over a period of twenty-five years. This method of test was found so severe that most samples failed very early in the investigation. After a study of our data, the Pipe Joint Committee recommended that our tests be modified to include as a start five reversals only at a load representing a 30° Fahr. change. Providing the specimen successfully withstood these tests, it was examined in the same manner with loads representing 40° and 50° Fahr. temperature changes respectively. Providing all such tests proved to be satisfactory, the joint was then tested as before with a load equivalent to a 60° change. If satisfactory, a single reversal was made at each 10 lbs. increment in pressure up to 50 lbs., or until failure occurred.

The following 4-in. cast-iron pipe sample joints were made up and tested:

(1) Cement and yarn.
(2) Cement, sand, and yarn.
(3) Rubber, cement, and braided jute.
(4) Cast lead and yarn.
(5) Cast lead, rubber, and braided jute.
(6) Cast lead and yarn, with machined bell and spigot.

The reversal at which leakage first occurred was not always taken as the point of failure. If the amount of leakage was slight, tests were conducted until it became excessive, and this point recorded as being the end of the test.

Cement Joints Unsatisfactory.

Numerous tests indicated that joints composed largely of cement gave very unsatisfactory results. It was noted in the case of the No. 1 bell that its greatest strength seemed to lie in the bond formed between the cement and the surface of the spigot. With the No. 2 bell, as is known, the face is tapered more towards the bottom of the bell, thus resulting in a wedge-shaped joint which should, theoretically at least, give greater strength. Our results, however, did not verify this conclusion. It seems that driving in the cement with the front yarn is not as effective on the bell side with the tapered design, thus allowing leakage to take place more readily around the bell. In some of our more recent work it has been found possible to overcome this trouble somewhat by driving the cement in a different manner.

Results obtained on most of the rubber ring and cement joints tested were likewise unsatisfactory, as marked leakage was found to take place. Recently, however, some tests on a newer type of rubber ring have proved quite encouraging. It appears necessary, in order that good performance may be obtained, for the rubber to be thoroughly placed under compression by proper driving of the cement. Otherwise satisfactory results cannot be expected.

A number of tests were made on samples composed of a rubber ring topped with a pre-moulded cast-lead strip, the remainder of the joint being finished by cast lead. The lead strip permits compression of the rubber ring, and by casting and caulking the final lead strip into position it is possible to simulate the usual cast-lead joint, and, in addition, to secure the resiliency feature afforded by the rubber ring. This type of joint seems to show considerable promise and will be investigated further.

It was found that, where the bell or spigot of test specimens had been defaced by chisel marks, no great weight could be given the test results obtained from cast-lead and yarn specimens. The marks made in cutting out former cement joints made it practically impossible to secure a tight joint. After investigating this point rather thoroughly it was our opinion that even the rough surfaces of ordinary pipe, when subjected to alternate tensions and compressions, seem to mark the surface of the lead, thus resulting in leakage. For our own information several joint surfaces were rather carefully machined, made up, and tested. The results were so much more satisfactory that they indicate quite clearly the desirability of having as smooth surfaces as it is possible to attain.

Tests by Pressure.

After a review of our preliminary test data, the Pipe Joint Research Committee at its Jan. 7 meeting approved new test plans whereby the air pressure within the joint was started at 10 lbs. and maintained at this figure until leakage occurred. The test was then continued at 1 lb. until leakage again took place. The pressure was then reduced to 10 in. of water, and the tests continued until failure resulted, or until the required number of reversals had been completed. This change enabled us to obtain much more complete information on the performance of a joint over a considerable pressure range than was possible before where a constant pressure of 10 lbs. was used. These results have proved much more satisfactory than under our initial test plan.

* Paper before the Canadian Gas Association.

At the start of our test programme, a number of member gas companies were solicited to submit samples of joints that had been in service for ten or more years. As a result, over thirty joints were received, some of which had been in service as long as fifty years. The sizes of these joints ranged from 3 to 8 in., although most of them were of the 4 and 6 in. sizes. With each sample we secured a complete questionnaire giving the history of the joint and all important and necessary information on it. Leakage tests were made on the joints as received. In order that these tests might be made, the ends of the joints were closed with line caps. Where the pipe was found to be in such condition that this could not be done, the ends were sealed with wooden plugs. Tests were made on 25 different samples, about two-thirds of which leaked at 10 lbs. pressure. No particular significance should be attached to these results, however, as leaking samples were requested. Furthermore, most of them were from low-pressure districts and could not be expected to withstand satisfactorily such high pressures.

Most of the leaking joints were of lead. A distinct separation between the spigot and the lead was noticeable, in some cases at two points, about 180° apart. From all appearances, practically all of these samples had been apparently subjected to numerous movements normal to the plane of the pipe, indicating quite conclusively the effects of ground settlement and, in some instances, possibly, vibration.

On the theory that considerable leakage was caused by ground settlement or vibration, or both, it was decided that a practical means of determining the effectiveness of various methods of repair would be to subject these joints to transverse bending tests.

Samples were placed on the table of a testing machine resting upon two knife edges located about 5 ft. apart. The load was then applied directly upon the face of the bell and the movement in each instance measured by a deflectometer in contact with the bottom side of the bell. Deflections varied during these tests from ¼ in. to 1 in., depending upon the size and type of joint tested. Once a test was completed, the joint was then rotated through an angle of 180° and a load applied to deflect it back in the other direction.

Before the completion of our bending tests, a questionnaire was sent out to a number of leading distribution engineers located throughout the United States and Canada. The purpose of our inquiry was to secure information on various methods of repairing bell and spigot joints and such recommendations as might be offered on the most effective methods of repair. Approximately 25 replies were received, and the most common methods appeared to be as follows:

(1) Cut out the old joint material and re-make joint.
(2) Re-caulk.
(3) Apply leak clamps.

In preparing our test specimens, we followed, in so far as was possible, the methods of repair outlined in the different replies. After a joint was repaired, it was then given a deflection test, and the test performance taken as a measure of the effectiveness of its repair. In all, six different and common methods of repair were investigated. In each case the joints were found to be tight under 50 lbs. pressure before the initial deflection test was applied. After this test, however, it was found that in only one instance did the joint remain tight. This particular sample had been made by cutting out the old material down to the back yarn and filling it with cement, caulked in place by lead wool. Several other specimens were prepared in a similar manner and tested to confirm our results; but none of them proved satisfactory.

Deflection Tests.

Deflection tests made on joints repaired with leak clamps gave far more encouraging results than any other method investigated. Over twenty different tests were performed on a clamp of special design, using either rubber or duck and rubber gaskets. It was also found during these tests that the application of a gasket cement improved the joint considerably. It was found that a factor influencing the performance of clamped joints was the degree of roughness of the bell face and the distance to which the lead had been recessed beyond it. Smooth surfaces apparently gave the most satisfactory results. All other things being equal, the best performance was secured when the lead was re-caulked as nearly as possible flush with the face of the bell.

The effect of vibration upon the effective life of gas mains has long been a subject of controversy among gas men. Many different theories have been proposed and extensive data advanced to substantiate different claims. Our experience so far indicates that it is a subject to be very thoroughly reckoned with, althqugh we do not believe that it deserves the importance that some engineers are inclined to ascribe to it. We feel that where pipe is already under some transverse strain, such as might be caused by settlement of the ground, leakage may be encouraged, especially with lead joints. In fact, a careful examination of the old sample joints submitted seems to substantiate this claim. From a theoretical standpoint it does not appear that cement joints should be affected to the same degree by excessive vibration as those prepared of lead, although unquestionably excessive vibration would in time have an injurious effect. There are so many variables entering into a consideration of this subject, such as the nature of the soil, depth of the main, the construction of the joint, the amount and nature of traffic present, and the pressure carried within the pipe itself, that it is almost impossible to arrive at any general conclusion.

A review of all our test results to date indicates on all kinds of joints tested the effect of line pressure on leakage. It is evident that too much reliance should not be placed on bell and spigot joints made with cast lead or cement when subjected to a working pressure much greater than 10 in. of water. A careful study of our data indicates that it was possible in but few instances to complete entirely a test at 1 lb. pressure without leakage. Even the carefully made lead joints of the machined bell and spigot failed to remain tight after a few reversals at 1 lb. pressure. Consequently, it seems that the safe working pressure lies somewhere between these two lower limits.

During the course of our later tests it was found that the manner in which cement joints are cured has a very definite bearing on their performance. On careful consideration it seems that this conclusion would naturally be anticipated, although it is very doubtful if its full importance is sufficiently recognized during the preparation of joints in the field. Samples wrapped in burlap and kept moistened during the period required to secure their final hardening gave far better results than those normally exposed to the air. It was also found that with cement joints the kind of yarn used had considerable bearing on their performance. Square braided jute about ⅝ in. square section seemed to give the most satisfactory results.

Tests have also been under way for some time to determine the effect of different kinds of gases upon yarns. Information of this kind should be particularly valuable to gas companies considering a change-over in their supply. One of the most annoying features experienced in changing over from a manufactured to a straight natural gas supply is the drying out of the oil and moisture absorbed by joint materials.

A study is now being made of the performance of joints, using various kinds of rubber rings with both lead and cement. It is planned also to test further the different makes of cement. In addition to this plan we propose to investigate the effect of curing cement joints in various ways, either by adding water or by sealing the surface of the cement to prevent the escape of moisture.

In an added effort to cover all important phases of this subject chemical analyses were made of quite a number of different commercial grades of lead. Photo-micrographs were also taken to permit a study of their grain structures. In order to determine the effective depth of caulking, a number of samples were prepared in a split sleeve joint. By unbolting the sleeve and cutting through the lead it was possible to secure a cross-section from which a photo-micrograph was prepared showing the grain structure. In this way it was found that the effective depth of caulking varied considerably, depending upon the manner in which the joint was caulked and the weight of the hammer used. The maximum depth obtainable with hand tools was somewhat less than ⅜ in.

While some of our special investigations made on lead and cement disclosed a great deal of information that is very interesting, and which will unquestionably be essential in completing a full study of our problem, it does not seem that there is any marked difference in the quality of standard grades of these materials supplied the trade. The solution to our problem seems to revolve around the type of joint selected rather than about the quality of material used in its preparation. It is also quite evident from our test results that the methods by which joints are prepared are of utmost importance in insuring their ultimate success.

Several months ago the American Gas Association entered into a contract with the Cast-Iron Pipe Research Association to conduct tests on certain kinds of patented joints. While, in part, these tests will follow quite closely the methods which I have described for new bell and spigot joints, tests will be made at considerably higher pressures. Although this work is being done for, and at the expense of, an outside organization, the results obtained should prove of considerable value to us by throwing further light on portions of our own investigation.

Summary.

While it is realized that we have only made a fair start on our Pipe Joint Research Investigation, the results to date seem to warrant the following assumptions:

(1) Smooth surfaces of the bell and spigot are highly desirable in the case of cast-lead joints.
(2) Joint leakage under the conditions of our tests appeared to be rather more of a function of the pressure carried than it did of the kind of joint employed. Both cement and lead joints were uniformly unsatisfactory for pressures greater than 1 lb.
(3) Leaking joints repaired by the use of leak clamps gave the best performance results.
(4) The successful performance of a cast-iron pipe joint seems to depend more upon the type of joint and its physical arrangement rather than upon the quality of the material used in its preparation.

South Metropolitan Gas Company.

Alliance with the Commercial Gas Company.

An Extraordinary General Meeting of the proprietors of the South Metropolitan Gas Company was held at the Cannon Street Hotel, London, E.C., on Wednesday, July 30, 1930, to consider and, if thought fit, to approve an agreement between the Company and the Commercial Gas Company made under the South Metropolitan Gas Act, 1925, and any other powers in that behalf.

Dr. CHARLES CARPENTER (President of the Company) was in the chair.

Mr. FRANK DAY (Secretary) read the notice convening the meeting.

The PRESIDENT said: Ladies and Gentlemen,—I must preface my remarks this morning with an apology for your having been called together at so comparatively short an interval after the annual meeting in order to deal with a matter which might then have come before you in the ordinary course; but I can assure you that the delay has been wholly due to unavoidable causes.

You will remember that five years ago you gave your unanimous approval to this Board seeking Parliamentary sanction for a Bill it had deposited the previous year which had for its object the association of this Company with other similarly constituted and neighbouring undertakings. That Bill became in due course an Act. By its provisions we were empowered to enter into agreements for, *inter alia*, pooling our resources, for the purchase of raw materials, for the manufacture and marketing of products, for the prosecution of research, &c. The machinery for carrying into effect such associations consisted of an exchange of stocks issued by the respective undertakings—that is to say, in return for the surrender of a substantial block of their ordinary stock by the proprietors of one undertaking, the other undertaking would exchange an agreed equivalent of its preference stock. Now the Board of this Company and that of its neighbour, the Commercial Gas Company, have entered into a provisional agreement of this kind and as contemplated by our Act of 1925. Its validity depends upon the endorsement of the proposal by the shareholders of both undertakings, and it is for this purpose that you have been called together to-day to consider its provisions. A similar procedure will be followed in the case of the Commercial Company, and if the consent of both bodies of shareholders is obtained, there will only be needed the formal approval of the Board of Trade (as regards which I do not imagine any difficulty can arise) to make the association a *fait accompli*, provided the holders of a sufficient proportion of Commercial ordinary stock elect to make the exchange.

The purport of the agreement has been fully advertised in the Press, and I think I had now better deal with its provisions. It is neither a very formidable nor a very complicated document.

The agreement commences by a recital of the status of each of the two undertakings. It refers to this Company's Act of 1925, by which such agreements are authorized, and the purposes of those agreements; it recites the desire of the Commercial Company to achieve the best possible results from the raw material purchased by it and in the utilization of the gas produced therefrom; it refers to the possession by this, the South Metropolitan Company, of a staff and laboratories equipped for the purposes of research; and expresses the desire of the Commercial Company to participate in this and other services. It then goes on to say: "Now it is hereby agreed between the parties hereto as follows (that is to say)," and the various clauses of the agreement are set out.

Clause 1 deals with the chemical analysis of coal used by and the bye-products made by the Commercial Company. Clause 2 deals with the furnishing of samples of such materials to the laboratories of the South Metropolitan Company. Clause 3 deals with the reports upon and the deductions to be made from such analyses. Clause 4 deals with the testing of various apparatus used for the production of light, heat, or power by gas and coke. Clause 5 provides for advice and assistance being given to the Commercial Company in relation to the purchase and sampling of coal and the production and disposal of bye-products. Clause 6 requires this Company to place at the disposal of the Commercial Company certain facilities it possesses for the handling of coal.

Clause 7 deals with the financial consideration, and I think I had better read parts of this in full. Sub-section (1) reads as follows:

> The Commercial Company and their Directors shall forthwith use their utmost endeavours to secure that holders of ordinary stock of the Commercial Company shall within three months of this agreement being approved by the proprietors of the two Companies respectively as hereinafter provided or within such further time as the Boards of Directors of the said two Companies may jointly determine agree to transfer to the South Metropolitan Company or their nominees fully paid up ordinary stock of the Commercial Company (hereinafter called "Commercial stock") to the aggregate nominal amount of six hundred and ninety-one thousand and ninety-three pounds in exchange for six per-centum fully paid irredeemable preference stock of the South Metropolitan Company (hereinafter called "South Metropolitan preference stock") to the aggregate nominal amount of six hundred and thirty-five thousand eight hundred and five pounds to be issued at par on the basis that each holder of Commercial stock so transferring shall receive ninety-two pounds in nominal value of such South Metropolitan preference stock in exchange for each one hundred pounds in nominal value of such Commercial stock. . . .

Then the clause goes on to provide that in the event of holders of the requisite amount of Commercial ordinary stock agreeing to exchange their stock, and of the Board of Trade approving, the South Metropolitan Company will issue its preference stock in exchange, such stock to rank *pari passu* with the existing 6 p.ct. irredeemable preference stock already issued to the amount of £500,000 by the South Metropolitan Company.

Sub-section (2) of the clause fixes the minimum of £50 in respect of the exchange. Sub-section (3) provides that the Commercial Company will use its best endeavours when next in Parliament to obtain powers to enable them, when issuing further capital, to issue a portion of it to the South Metropolitan Company, so that the latter may obtain its quota. Sub-section (4) provides that in the event of the Commercial Company obtaining such powers, notice shall be given to the South Metropolitan Company of its intention when any future issue is contemplated. The method of arriving at the price to be paid is set out in the clause.

The final sub-section of the clause requires the Commercial Company, in the event of such fresh powers of issue not being obtained, to use its best endeavours, on the occasion of any new issue, to obtain a voluntary exchange by their shareholders.

Clause 8 of the agreement provides for the addition to the Board of the South Metropolitan Company of a nominee Director from the Commercial Company so long as such person continues to be a member of the Commercial Company's Board and is nominated by it.

Clause 9 provides that the Directors of the Commercial Company shall use their best endeavours to secure that the persons who shall from time to time be Directors of the Commercial Company shall include three ordinary Directors of the South Metropolitan Company, but not more, from time to time nominated for the purpose by the Board of Directors of the South Metropolitan Company.

Clause 10 provides that none of the officers or the workmen employed by the Commercial Company at the date of the agreement shall suffer loss in advancement, status, or emoluments. Sub-section (2) of that clause provides that any person who is a member of the Commercial Company's Board and desires to retire within six months of the approval of the agreement, the South Metropolitan Company shall pay as compensation for loss of office the equivalent of seven years' fees.

Clause 11 provides that this agreement is subject to the approval of the shareholders of both Companies. Clause 12 sets out that the agreement is made under the provisions of the Act of 1925 to which I have referred, that it is subject to the approval of the Board of Trade, and that each party must use its best endeavours to obtain that approval. Clause 13 is an arbitration clause, and provides for the submission to an arbitrator of any differences which may arise between the two undertakings in relation to the agreement.

Clauses 14 and 15 provide that neither party shall assign its rights without the consent of the other. Clause 16 provides for the giving of notices by either party to the other as required under the terms of the agreement, and Clause 17, which is the final one, provides that the parties shall bear their own costs, in addition to half stamp duties. The common seals of both Companies have been affixed to exchange copies of this agreement.

I do not think, Ladies and Gentlemen, that it will be necessary for me to say much more in explanation of these proposals, for I dealt very fully with the principle involved by such agreements when discussing our association with the South Suburban Gas Company, which forms a precedent for the agreement now under consideration. The only material difference between the two cases is that in the earlier one provision was made for a supply of gas in bulk to be given by the South Metropolitan Company in order to avoid the erection of new works required for its increasing business by the associating undertaking. This obligation does not enter into the present proposal, for the district supplied by the Commercial Company has been for a great many years past described as being within a ring fence, and it contains no undeveloped, or perhaps I should rather say, unbuilt-upon area.

A STRONG INCENTIVE.

If the arrangement is carried out we become the largest ordinary shareholder in the Commercial Company, and this provides the strongest incentive for us to do everything possible in the way of using our own organization in assisting it to achieve the highest possible technical and economic results. We thereby protect their ordinary shareholders and, in consequence, under the provisions of the basic price Act, the public served by that Company. In return we undertake the responsibility involved by the shares we give in exchange carrying a preferential instead of an ordinary value.

While the arrangement, in my opinion, gives all the material advantages of the sometimes discredited merger, it is free from its disadvantages, as each undertaking retains its own individuality both as regards its staff and its employees, while at the same time the purchasing and selling experience, the physical and chemical research laboratories, and the bye-products works of the larger Company can be called upon for assistance by the associated undertaking. Our arrangement with the South Suburban Company has now been running sufficiently long to enable an opinion to be expressed as to how far the expectations formed of it have been realized, and it is with this to guide them that your Board put forward and ask your approval of their present proposals.

I now formally move:

> That the agreement dated the Ninth day of July, 1930, and made between the South Metropolitan Gas Company of the one part and the Commercial Gas Company of the other part, be and the same is hereby approved, subject to such alterations, variations, and additions as the Board of Trade may think fit

to make therein, and as the Directors of the South Metropolitan Gas Company may approve.

I will ask the Vice-President to second that.

Mr. FRANK H. JONES (Vice-President of the Company) seconded the resolution.

The PRESIDENT: The matter is now open for discussion. I will do my best to deal with any matters which any shareholder may desire to raise.

There being no response to the invitation to the shareholders to discuss the agreement, the resolution was put to the meeting and carried.

This concluded the business of the meeting.

Commercial Gas Company

Agreement with the South Metropolitan Gas Company Unanimously Approved.

An Extraordinary General Meeting of the Proprietors of the Company was held at the Cannon Street Hotel, E.C., on Thursday, July 31, to consider, and, if thought fit, to approve an agreement between the Company and the South Metropolitan Gas Company which has been entered into under, and by virtue of, powers conferred upon both Companies by the South Metropolitan Gas Act, 1925. Mr. W. G. BRADSHAW, C.B.E., presided.

The GENERAL MANAGER AND SECRETARY (Mr. F. J. Bradfield) read the notice convening the meeting, the main points of which were as under.

The agreement is subject to the approval of the Board of Trade, and its main object is to enable the Company to have the benefit of any premises, plant, organization, operations, or other facilities of the South Metropolitan Gas Company in relation to the manufacture and sale of gas. The agreement also provides:

(*a*) For the analysis of samples of coal and/or residual products of coal and the testing of apparatus by the South Metropolitan Company for the Company.

(*b*) For the giving of assistance by the South Metropolitan Company to the Company in relation to the purchase of coal and the sampling and disposal of residual products.

(*c*) For the unloading of coal at the South Metropolitan Company's landing stage at East Greenwich and placing into barges for the Company.

(*d*) For the exchange of £691,093 Commercial Gas Ordinary Stock by the holders thereof for £635,805 Six per cent. Irredeemable Preference Stock of the South Metropolitan Company, in the proportion of £100 Commercial Ordinary Stock for £92 Six per cent. South Metropolitan Irredeemable Preference Stock. If applications for the exchange of the whole amount are not received, the agreement is to become void.

(*e*) On the occasion of any future issue of capital by the Company, for the issue of a certain proportion of such capital to the South Metropolitan Company or for the exchange of a certain amount of such capital by the holders thereof for stock and securities of the South Metropolitan Company.

(*f*) For the appointment of a Director of the Company to be a Director of the South Metropolitan Company, and for the Directors of the Company to endeavour to secure that the Directors of the Commercial Company shall include three ordinary Directors of the South Metropolitan Company from time to time nominated by the Directors of the South Metropolitan Company.

(*g*) For payment by way of compensation by the South Metropolitan Company to any Director of the Company who, after the approval of the agreement by the Board of Trade, intimates his willingness, in order to expedite the carrying into effect of the objects of the agreement, to vacate his office as a Director of the Company, of a sum equal to seven years' purchase of the fees received by him during the year 1929.

A further communication will be sent to proprietors if, and when, the agreement has been approved by the stockholders of the two Companies and the Board of Trade, with a form on which individual stockholders wishing to avail themselves of the opportunity to exchange stocks can make the necessary application.

The CHAIRMAN: Ladies and gentlemen,—This Extraordinary General Meeting has been called to consider and, if approved, to sanction an agreement which has been made provisionally between this Company and the South Metropolitan Gas Company. You have received, in the notice summoning the meeting, and which has been read to you, a summary of the chief proposals and conditions set forth in the agreement; and if you will give me your attention for a few minutes, I will explain some of the reasons which led your Directors to submit to you for your approval the offer which they received some time ago from the Directors of the South Metropolitan Company.

THE COMMERCIAL COMPANY'S DISTRICT.

You are aware that the district which is supplied by the Commercial Company is surrounded by that of the Gas Light and Coke Company on three sides, and that it is bounded on the fourth side by the River Thames and is fully built over. Consequently expansion by the absorption of other Companies or from the erection of new buildings on vacant land is not possible. It is mainly of an industrial character, and otherwise contains to a large extent only the residents of the working classes. It is true that large blocks of flats are in some places taking the place of cottage dwellings, but the erection of these is mostly in the hands of the local authorities, who are also the owners of the electricity supply, and they, perhaps naturally, do all in their power to prevent and discourage the use of gas by their tenants.

The Company has three comparatively small works only one of which, the Wapping Station, which is the smallest of the three, is situated on the River Thames. The wharf at that station will only accommodate ships of about 1000 tons burden, which are expensive to operate compared with ships of larger size; and all the coals which are brought to the other two stations have to be transhipped in the Thames at heavy cost into barges or lorries, or, in the case of the Poplar Works, to be carried in still smaller ships of some 600 or 700 tons capacity, which are still more costly.

The other two Metropolitan Companies have large modern works with all the latest improvements in construction, machinery, and lay-out situated directly on the River Thames, with wharves at which large steamers can discharge their cargoes of coal directly into their carbonizing plant, and are thus enabled to obtain their raw material and to manufacture and distribute their products in the most economical and profitable way. Then again, our Company is very much smaller than either of them. It is less than one-fourth the size of the South Metropolitan Company, and less than one-twelfth the size of the Gas Light and Coke Company, and, from its position in the East End of London and the character of the district it serves, is the first to suffer from any depression in trade and the last to benefit by any revival. Parliament has repeatedly recognized the difficulties with which we have had to contend, and granted us somewhat better terms in consequence.

In spite of these handicaps, I am proud to be able to say that during the 42 years in which I have known the Company, and, indeed, for many years before that, it has maintained its position as compared with the other two Companies. Our prosperity has been equal to theirs; our working results have not been inferior to those of our larger and more fortunate neighbours; the cost of the gas supplied to our consumers has not on the whole been greater than theirs; our co-partners have received commensurate, and more than commensurate, benefits; and the dividends which we have been able to offer for your acceptance have certainly not fallen behind, on the average, the distribution of profits which our Metropolitan neighbours have made to their shareholders.

BENEFITS OF THE ALLIANCE.

Your Company is in first-rate order and condition; its works, I think I may say, are better equipped than they have ever been; we have a staff of officers and employees in whom we may place entire confidence; we are on exceedingly good terms with our consumers, who are well satisfied with the quality of the gas we supply and the services we render them; we have had a good half-year; and we only need an improvement in the trade and prosperity of our district to enable us to go ahead with an increased prospect of success. But, even taking all this into account, we feel—and I think you will agree—that a Company situated as we are and having the peculiar difficulties which I have described to contend with, cannot but be benefited by an alliance with a richer and more favourably placed neighbour such as the South Metropolitan Gas Company undoubtedly is; and it is obvious that their support and assistance will be of great value in maintaining and promoting the prosperity which this Company has hitherto enjoyed. When, therefore, Dr. Carpenter placed before us the proposal which is embodied in the agreement which we are considering, we felt that, although in some ways it was against the grain to accept it, we could not without a grave dereliction of duty refuse to submit it to you for your careful consideration.

Now let us look at the proposal, and first as regards the effect upon the Company as distinct from the individual shareholders. The most cursory inspection of the notice sent you will have revealed that it comprises an arrangement whereby, in exchange for certain facilities of a scientific and practical nature which the comparatively smaller size of our Company has prevented us from providing—although we have been well aware of their value in cheapening and improving the gas and other commodities supplied to our customers—we are to accept three Directors of the South Metropolitan Company nominated by their Board as Directors of our Company, and to have one Director of our Company nominated by us to represent it upon their Board. That combined with the exchange of capital, as to which I will speak presently, it cannot be denied, will give to the South Metropolitan Company a dominant influence in our Company. The ultimate control will be in their hands. At first sight it might appear that there is some objection to this. But, gentlemen, I would remind you that the proposal is for an *alliance* with *friends*, some of whom have been actively engaged upon our Board for years past in promoting the welfare and prosperity of our Company. It is not a *sale* to competitors or rivals; and the fact that they will own no less than one-third of our capital will be more than sufficient inducement to them to use their fullest endeavour to maintain and increase the efficiency of our Company and its prosperity and to augment, if possible, the rate of dividend which we pay to our shareholders; and I submit that the history of the South Metropolitan Company and the pre-eminent place which it has achieved among the gas companies of the world is sufficient evidence that they are well able to do for us what they have already accomplished for their own institution. It must be obvious to you all that whatever benefit the

South Metropolitan Company derive from this proposed arrangement (beyond the dividend on the larger amount of Commercial ordinary stock which they are to receive) must depend on the improvements and economies which they are able to effect in the working of the concern with which they are seeking this close relationship.

No Loss of Identity.

The Company as a Company is not, except in the change of control, directly affected by the exchange of shares, and the acquisition of the facilities and organization foreshadowed in the notice of the meeting cannot be otherwise than advantageous to it. It will not lose its identity, it will keep its name and its capital and its staff intact, and it will have some of its present Directors to watch and help forward its interests. We may say, therefore—I think we *must* say—that so far as the future of the Commercial Gas Company is concerned the proposal ought to be welcomed and accepted with every confidence. I need not remind you that anything which is to the advantage of the Company must bring a like benefit to the consumers, for consumers, shareholders, and employees are bound together into an indissoluble co-partnership with identical interests.

Now let us examine the proposal as it affects the individual shareholder. But first let me clear the ground by explaining what the offer to him is. Any shareholder of the Commercial Company is at liberty to *offer* to exchange all or any part of his holding of ordinary stock for 6 p.ct. preference stock of the South Metropolitan Gas Company in the ratio of £92 of South Metropolitan preference stock for £100 of Commercial ordinary stock. That involves a diminution of income of 9s. 7d. p.ct. per annum so long as the Commercial Company continues to pay a dividend of 6 p.ct. per annum, but it will be realized that whereas the dividend on the Commercial stock over 5 p.ct. per annum is dependent on surplus profits being earned by the Company, the South Metropolitan preference dividend is to all intents and purposes permanently assured, as it ranks prior to the dividend on the £6,709,895 ordinary stock of that Company, which last year amounted to £419,368, and the dividend on the Commercial Company's ordinary stock to be acquired by the South Metropolitan Company will further go to increase the security of the dividend on their preference stock. Those who make the exchange will benefit by having a permanent investment yielding just over 5½ p.ct., which rate is not dependent, as is the dividend on the ordinary stock, on the price of gas and residual products, and is not affected by fluctuations of trade.

This advantage is evidenced by the variation in the market values of the two stocks. The South Metropolitan 6 p.ct. preference stock, prior to the publication of the proposed agreement, was quoted at 109¾ p.ct., so that it may be assumed that £92 of such stock was worth £100 14s. 10d. The market value at the same date of £100 of Commercial ordinary stock was £91 10s., which shows an appreciation in the market value of £9 4s. 10d. p.ct.

No Obligation on the Shareholder.

The agreement, if and when it is passed, will impose no obligation on any shareholder to make the exchange of shares or not to make it. It simply confers upon him an option for which he has not to pay anything, and which he is perfectly free to exercise or not as he pleases. I have, I think, shown (I hope conclusively) that the association of the two Companies cannot but benefit the Commercial Company. Therefore, if a shareholder of that Company prefers to keep his capital in it as it is at present, he is at liberty to do so; and if the agreement is approved and becomes effectual he may look upon his investment as of improved market value and with somewhat better prospects than it has at present. Further, if the shareholder decides to exchange the whole or part of his capital, the result will be to him that he will receive a slightly smaller dividend but a largely increased security (amounting to almost a certainty) that the smaller dividend will be maintained; and he will also have a well-founded anticipation that any portion of his holding which he does not convert may yield him a somewhat better return in the future than it does now.

That is clearly a favourable position to be in; and I am sure that you will agree that it was incumbent on the Directors to put the offer before the shareholders.

Now, gentlemen, the notice calling the meeting contains a summary of all the essential parts of the provisional agreement, and the agreement itself has been open to inspection for some time at the Offices of the Company. Therefore, unless you particularly desire it, I do not propose to go through the somewhat dreary process of reading and commenting on it clause by clause, for that would only serve to confuse the business which we are here to transact; but, of course, I am ready to do so if you wish it.

I will conclude my remarks with the observation that in our opinion the Commercial Company and the shareholders have much to gain and nothing to lose (except possibly on sentimental grounds) by this proposed arrangement.

The desirability of the amalgamation of gas companies has been recognized by Parliament for more than fifty years, and the special powers granted to the South Metropolitan Company by their Act of 1925, under the powers of which the present proposal is made, were conferred in order that, where amalgamation was not possible or was not desirable, arrangements such as this might be facilitated. We are, therefore, proposing to carry out an operation which has already been approved in principle by the Legislature.

The agreement has been sanctioned by the shareholders of the South Metropolitan Company, and, when the shareholders of the Commercial Company have signified their consent, it will only require the approval of the Board of Trade to make it effective.

I may say that we have received many evidences that the scheme is approved by the general public. The stock of both Companies was marked up in the Official Stock Exchange List on the day when it became known. Before the announcement the average quotation of the Commercial Company's ordinary stock was 91¼ p.ct., and thereafter (before it was quoted *ex* div.) the market price was 95½ p.ct. A very large number of shareholders unable to be present with us to-day have sent us their proxies in favour of the scheme, and although some of the staff and other employees of the Company may possibly feel a little nervousness lest their interests should not be so carefully considered in the future as in the past, they are nevertheless gratified that the premier Gas Company, as they regard the South Metropolitan Company, should desire such an alliance with their much smaller neighbour. A better knowledge of what the Directors of the South Metropolitan Company have done, and are doing, for their employees would, I think, completely reassure them as to the future. I trust that I have succeeded in convincing everyone present, who was not already convinced, that your Directors were bound to place this offer before you and that the proposal is in the best interests of the Company and of its shareholders, as well as the consumers and employees, and ought to receive a unanimous welcome and approval. I beg, therefore, to move the following

Resolution.

> "That the agreement dated July 9, 1930, and made between the South Metropolitan Gas Company on the one part and the Commercial Gas Company on the other part be, and the same is hereby, approved subject to such alterations, variations, and additions as the Board of Trade may think fit to make therein and as the Directors of the Commercial Gas Company may approve."

The Deputy-Chairman (Mr. H. W. Gell, O.B.E.) seconded the resolution, which, he added, had the whole-hearted support of every member of the Board.

The Chairman, replying to points raised by proprietors, said it had been decided that the applications for exchange would be dealt with in the order of their reception, and as soon as the full amount was reached the list would be closed. There was a precedent for making this arrangement, as it was the method adopted by the South Suburban Gas Company when they entered into their agreement with the South Metropolitan Company. Though it was a fact that proprietors who exchanged would lose some 8 p.ct. of the face value of their stock, they would gain between 9 and 10 p.ct. in market value.

The resolution was then put and carried unanimously.

Croydon and East Surrey Gas Order.

At the Offices of the Board of Trade in London on Tuesday, July 29, Mr. J. F. Ronca, O.B.E. (Director of Gas Administration), began an inquiry into an application by the Croydon Gas Company for an Order under section 10 of the Gas Undertakings Acts, 1920 and 1929. It is a long time since there was so much opposition to an Order under section 10; and the proceedings were reminiscent of the days before the Act of 1920 when so many big fights over Gas Bills took place in the Committee Rooms of the Houses of Lords and Commons. In the present instance no fewer than nine local authorities were in active opposition.

The Croydon Gas Company were represented by Mr. F. J. Wrottesley, K.C., Mr. Jacques Abady, and Mr. E. C. Woodall. For the opponents, Mr. Rowand Harker, K.C., and Mr. S. G. Turner appeared for the Reigate Corporation, the Reigate Rural District Council, and the Godstone Rural District Council, while the remaining six opponents—viz., the Croydon Corporation, the Beddington and Wallington Urban District Council, the Carshalton Urban District Council, the Caterham and Warlingham Urban District Council, the Coulsdon and Purley Urban District Council, and the Epsom Rural District Council—were represented by Mr. H. Royston Askew. Others attending the inquiry included Mr. William Cash (Chairman of the Croydon Gas Company), Mr. W. J. Sandeman (General Manager of the Company), and Mr. Arthur Valon (Consulting Engineer acting for the Company), while on the other side were Mr. G. Evetts (Consulting Engineer for the six local authorities represented by Mr. Askew), and Lt.-Col. W. M. Carr (Consulting Engineer for the three local authorities represented by Mr. Rowand Harker, K.C., and Mr. Turner).

The object of the Order is to authorize the Croydon Gas Company to acquire the East Surrey Gas Company and the Oxted and Limpsfield Gas Company and to change the name of the Croydon Company to the Croydon and East Surrey Gas Company.

Mr. Wrottesley, K.C., outlined the terms of acquisition of the two Companies, adding that agreements had been signed. The capital of the East Surrey Company consisted of £53,220 6 p.ct. cumulative preference stock and £126,700 5½ p.ct. "A" preferred stock, together with £179,500 "B" ordinary stock, and it was, he said, in regard to the latter stock that a great deal of controversy would arise. The "B" ordinary stock of the East Surrey Company was a 5 p.ct. standard dividend stock, on a sliding scale. It was proposed to issue, in respect of the £53,220 6 p.ct. stock, £120 5 p.ct. debentures in the Croydon Company for every £100 of East Surrey stock. New 5½ p.ct. Croydon preference stock would be issued in respect of the £126,700 "A" preferred stock of the East Surrey Company, so that these shareholders would be in the same position as at present; but in respect of the £179,500 "B" ordinary stock a different procedure was proposed. This "B" stock was now earning 5½ p.ct., and the proposal was to give £30 of 5 p.ct. maximum

dividend stock and £70 of sliding-scale stock, which was a 3½ p.ct. standard dividend, but which was, in fact, earning 7 p.ct. at the moment, although authorized to receive £7 2s. 6d. Thus the total dividend received in respect of the "B" stock, if the amalgamation took place, would be £6 8s. p.ct., as against the present £5 10s. p.ct.

In the case of the debenture stock of the East Surrey Company, it was proposed to give £80 of 5 p.ct. debentures in the Croydon Company for every £100 of 4 p.ct. debentures in the East Surrey Company. The £30,000 7½ p.ct. redeemable debenture stock of the East Surrey Company would be taken over by the Croydon Company, and would be redeemed on July 1, 1931, and, it was hoped, issued again on more favourable terms. The extra yearly sum, as compared with the present sum required, involved in these proposals would be £1615 10s. per annum. The Order also made provision for compensation to Directors and Officers on the basis of not more than ten years' purchase of the remuneration of the Managing Director and the Secretary—arbitration to be resorted to in case of disagreement—and seven years' purchase of the remuneration of the Directors. In the case of the Auditors, three years' purchase of the remuneration was proposed.

Under existing conditions, there were a number of differential prices in operation; and Mr. Wrottesley said the Directors of the Croydon Company frankly asked the Board of Trade to leave the reduction and ultimate discontinuance of these differentials in their hands. In the meantime, the first effect of the amalgamation would be that all prices charged at present in the new areas to be acquired would be reduced by 0·4d. per therm immediately.

As regards the Oxted and Limpsfield Company, continued Counsel, their dividends were limited only by the profits that could be made. The capital consisted of £10,000 7 p.ct. preference shares and £10,000 ordinary shares. It was proposed to give £8 5s. of 5 p.ct. maximum stock in the Croydon Company for every £5 of 7 p.ct. preferred stock of the Oxted Company, which would give a dividend of 8¼ p.ct., as against 7 p.ct. at present; and it was suggested that this would be a fair and reasonable exchange having regard to the fact that there were no debentures or loan charges in front of these preference shares. As regards the £10,000 ordinary stock of the Oxted Company, this at present was entitled to receive something like 14 p.ct., but it had been receiving 10 p.ct. The proposal in this case was to give £10 of Croydon 3½ p.ct. sliding-scale stock for every £5 of this ordinary stock; and this would give the 14 p.ct. which the Oxted ordinary stock was entitled to to-day. The compensation for Directors and Officers in this case was on the basis of ten years' purchase of the remuneration of the Secretary and Manager and seven years' for the Directors, with three years' for the Auditors.

Having thus outlined the general proposals of the Order, Mr. Wrottesley said the point for the Board of Trade to consider was whether the creation of larger units of gas administrations, such as would be brought about by this amalgamation, was desirable. Nobody, he said, could study the history of gas supply without being impressed with the manner in which amalgamations had taken place. It was possible, he mentioned, for a large undertaking to carry out research on a much larger and more scientific scale than a small company, and higher standards were possible not only in the matter of gas-making plant but in distribution and service generally. Again, large undertakings could purchase their raw materials, and especially coal, much more economically; and the net result was a lowering of overhead charges and fuller and more scientific use of the plant. If the Board of Trade were satisfied on this general question, it remained for them to be satisfied that the amalgamation proposed by this Order was justified; and the point he wished to make in this connection was that all the areas of the three Companies adjoined, that mains in many cases were practically joined up, and that the whole area was developing and must continue to develop very rapidly. He had no hesitation in saying that the result of the scheme as proposed must inevitably mean cheaper gas not only because of the opportunities for development in Croydon itself, but of the greater opportunities in the other areas and also by reason of the greater facilities which the Croydon Gas Company have for carrying out the work more scientifically and efficiently than could the two smaller Companies whom it was sought to acquire.

As regards the opposition of the local authorities, Mr. Wrottesley said there was a fallacy running through all the petitions. This was not a case of a compulsory purchase, but of an agreement by two Companies to be acquired on terms which had been negotiated and which both sides regarded as fair in all the circumstances. The opponents contended that the proposed exchange of capital was too generous, and there seemed to be the idea that the Board of Trade had the power to modify the terms of the agreements that had been come to. The position was that the parties concerned had come to agreements, and, as this was not a compulsory acquisition, there was no power on the part of the Board of Trade to modify them.

Mr. ROWAND HARKER, K.C., said this was not his view, and it was not so stated in his petitions.

Mr. WROTTESLEY replied that this was what the petitions meant, nevertheless. Continuing, he stated there was also objection to the terms of compensation to Directors and Officers, but added that there were many precedents for the terms proposed. The whole test of these petitions was whether the Croydon consumer was being unfairly treated, but the figures which would be put before the Director would show that this was not the case.

Mr. *William Cash* (Chairman of the Croydon Gas Company) gave evidence in support of the proposals, and said that if the present scheme was sanctioned, the Croydon Company would consist of an amalgamation of eight smaller Companies. As to the request of the Croydon Board of Directors that they should be left to deal with the various differentials as and when circumstances permitted, Mr. Cash said the whole experience of gas management was that the price must be reduced, and, as that happened, so the differentials disappeared. It was a far better policy than fixing a number of years during which a differential must disappear. At the same time, the Board of Trade were asked to stabilize the various differentials at 0·4d. per therm less than they were at the present time. He emphasized the point that in the case of Caterham the Croydon Company could charge a differential of 0·8d. per therm now, but in fact were not doing so. Speaking of opposition to the transfer of the renewals and insurance funds of the East Surrey Company to the Renewals Fund of the Croydon Company, Mr. Cash said that, although he thought this was the best plan, he would be willing to agree that half should go to the Renewals Fund and half to the Insurance Fund. The point was that the Insurance Fund at Croydon was used for Workmen's Compensation only. Speaking of the general advantages to the areas of the two Companies which it was proposed to take over, Mr. Cash observed that there must be benefits from the cheaper working at Waddon. As to the objections of the Croydon Corporation, Mr. Cash expressed the view that not only would the position of the Croydon consumer be no worse than it was at present, but that it must be improved in a very short time. He added that all the workpeople of the East Surrey and Oxted Companies were to be taken over on terms of employment equivalent to those they now enjoyed; and, moreover, they would have the benefit of the larger co-partnership scheme of the Croydon Company, so far as the East Surrey Company's employees were concerned, the Oxted Company not having a co-partnership scheme.

Wednesday, July 30.

Mr. ROYSTON ASKEW sought to show by a detailed analysis of the accounts of the Croydon Gas Company and the East Surrey Gas Company that the proposed terms of the amalgamation would place a burden on the consumers in the Croydon area, and that generally the terms agreed were too generous. His point was that the difference between the cost of gas production by the East Surrey Company and by the Croydon Company was more than the 3d. differential which would operate after the amalgamation, and that therefore the cost of gas to the Croydon consumer would either have to be increased, or that the Croydon consumer would be prevented from getting a decrease in price which might otherwise take place.

Summing up Mr. Cash's answers to a very large number of questions along these lines, and also other questions suggesting that the proposed compensation to Directors and Officers—which, by the way, was gone into in much greater detail by Mr. Harker, K.C., later in the day—was too much, the case on behalf of the promoters was that not only would the Croydon consumers not be treated in any way unfairly, but that, in fact, the consumers throughout the whole of the combined area, if the Order was granted, would in a very short time benefit by the economies and more efficient working both as to production and distribution that would be made possible. Mr. Cash showed how that, although the actual outgoings on account of revenue under the amalgamated scheme would be £1600 more per annum in respect of the added area than was the case at present, on the other hand there would be certain economies which would become immediately effective as a result of the amalgamation, which would leave a balance on the right side, as an offset against this £1600.

In answer to further questions, Mr. Cash pointed out that, although on the amalgamation there would be increased responsibilities for the Croydon Gas Company's Directors as compared with the present time, there was no suggestion of an increase of remuneration to these Directors.

Mr. HARKER, K.C., for the Reigate Corporation and two other local authorities, dealt at considerable length in the first place with the terms of compensation to be paid to the displaced Directors and Officers of the East Surrey and Oxted Companies. A certain difficulty was introduced in regard to this matter because the promoters asked, as a matter of courtesy between the parties, that the exact terms of the remuneration paid to the various gentlemen concerned should not be disclosed. Mr. Cash said he personally did not mind, but it had been suggested to him that the gentlemen concerned had suggested that their names might not be mentioned in connection with any particular salary.

Mr. Harker was loth to do this, as he said he was bound to discuss the detailed figures which had been handed to him, and which had been put in at the inquiry in the usual way. His point was that the terms offered were extremely generous. Eventually, Mr. Harker compromised by referring to certain salaries and emoluments by amounts, but associating them not with any particular case but with Official No. 1, Official No. 2, and Official No. 3, in the three instances he referred to.

Taking the case of Official No. 1, Mr. Harker pointed out that he was in receipt of a salary of £1600 per annum and also £500 Directors' fee—a total of £2100. It was pointed out that a sum of £18,000 was to be paid as compensation for loss of office which, invested at 5 p.ct., would bring in £925 per annum, in addition to which the capital would be intact. Moreover, this particular gentleman was to go on to the Croydon Board with fees of £500 per annum, so that he would be earning a total of £1425 per annum, have his capital intact, and only have to work as a Director of the Croydon Company. In the case of Official No. 2, his present salary was £1100 per annum, for which a lump sum of £11,000 is to be paid. Invested at 5 p.ct. this, said Mr. Harker, will bring in £550 per annum, give the gentleman in question his capital intact, and leave him with no work to do. Much the same position was stated in regard to official No. 3, whose salary was £1000 per annum. He was to receive £10,000, which, invested at 5 p.ct., would bring in £500, leaving the capital intact, and the gentleman in question with no work to do.

Mr. Cash said it would be extremely difficult for any of these officers to secure equivalent posts in other companies after the amalgamation. Two of them were 48 years of age, and one was 56 years of age. In the case of the last scheme of this character with which he was concerned, the displaced official in a similar position to those now being discussed did not succeed in obtaining another post at all. Mr. Cash also pointed out that under a superannuation scheme

these officers would, in a few years' time, be entitled to retire on two-thirds of their salaries.

Mr. HARKER's comment was that he was merely seeking the facts at the moment, and would make his submission to the Director on them in due course.

A long discussion then took place between Counsel and witness with regard to differential rates, Mr. Cash repeating the general case for the applicants that they asked the Director to stabilize the existing differentials, less 0·4d. per therm, the immediate reduction proposed by the scheme, and to leave the Directors of the amalgamated Company full discretion to deal with the reduction and subsequent elimination of the differentials as and when circumstances permit. It was also brought out during this part of the cross-examination that by taking over certain unissued capital powers of the East Surrey Company the amalgamated Company will have unexercised borrowing powers of £700,000; and Mr. Harker rather suggested that these would keep the Company from coming to Parliament or the Board of Trade for an undue length of time.

Mr. Cash, however, showed that at the present rate of capital expenditure of both the Croydon and East Surrey Companies—and he anticipated that it would have to be increased to keep pace with development—these unexercised capital powers would last between six and seven years.

The next point made by Mr. Harker was the possibility that in certain areas now to be added, the supply of gas would come from the Croydon Works, where it was made very much more cheaply than at the East Surrey Works; yet there was to be a differential charge in these added areas.

Mr. Cash pointed out that for the time being the amalgamated undertaking would be burdened by the higher capital expenditure of the East Surrey and the Oxted Companies, and this in itself justified the continuance of the differential. For instance, the capital expenditure per million in the case of Croydon was £564, in the case of the East Surrey Company it was £922, and in the case of the Oxted Company it was £786.

The question of prices now charged by the East Surrey Company was then raised by Mr. Harker, who pointed out that the Reigate Corporation a short time ago applied to the Board of Trade for an inquiry into the prices charged in Reigate by the East Surrey Company, with a view to reduction. When the present application was heard of it was suggested to the Board of Trade that it should be postponed, and that the two applications should be heard together. To this, however, for some reason, the Board of Trade did not consent; but a letter was sent to the Reigate Corporation stating that the Board would agree to questions relating to the prices in Reigate being put during the course of the present inquiry. Mr. Harker was clearly in a little difficulty, and stated these facts with a view to obtaining the views of Mr. Wrottesley, representing the promoters.

Mr. WROTTESLEY said he would raise no objection whatever to any questions being put during the course of this inquiry in regard to prices charged by the East Surrey Company in Reigate, but the position was that the East Surrey Company were not represented at the present inquiry, and, indeed, had no *locus* to attend. He was certain the Board of Trade would not come to any decision as to prices in Reigate in the absence of one of the parties; and, therefore, Mr. Harker could not hope for a reduction of the prices in Reigate as the result of any questions he might put to Mr. Cash or other witnesses for the Croydon Gas Company.

The DIRECTOR remarked that if the present Order were sanctioned, it would not be necessary to hold the inquiry into prices in Reigate.

Mr. HARKER, in view of what had been said, did not pursue his intended line of action in regard to the prices in Reigate, but questioned Mr. Cash in regard to the relative costs of manufacture of gas by the Croydon Company and the East Surrey Company. The figures were analyzed in some detail, the object being to suggest that as in the last accounts of the East Surrey Company there was an abnormal item in regard to law costs arising out of an action for polluting a stream, this should be deducted from the costs of manufacture for that year. In this way and in other ways it was sought to prove that there would be no justification for maintaining the differential in Reigate after the amalgamation, but Mr. Cash again pointed to the incident of the higher capital expenditure per million in the case of the East Surrey Company.

The concluding stage of the inquiry was reached on Thursday; and a full report of the proceedings will appear in the "JOURNAL" next week.

Council for the opposing local authorities addressed Mr. J. F. Ronca, particular mention being made of the proposed compensation to Officials and Directors of the East Surrey and the Oxted Companies, it being contended that this was excessive. Evidence was given by Mr. W. M. Carr, who made an investigation of the accounts of the East Surrey Company over a period of years.

REGISTER OF PATENTS

Apparatus for Metering Gas.—No. 331,439.

HUMPHREYS & GLASGOW, LTD., of 38, Victoria Street, S.W. 1 (Assignees of A. E. BLAKE, of Haverford Township, Pennsylvania).

No. 27,854; Sept. 13, 1929. Convention date, Oct. 18, 1928.

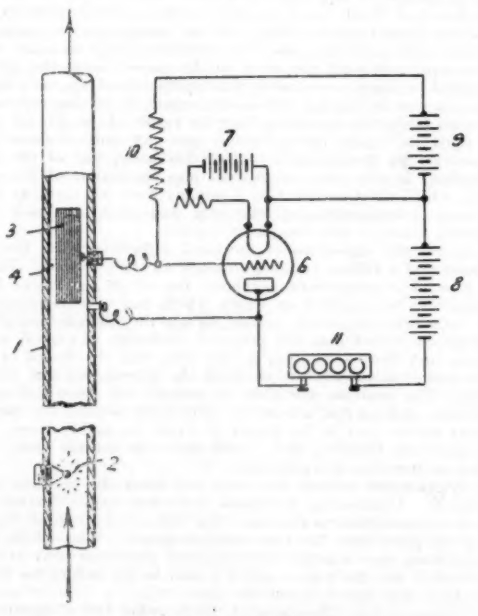
This invention relates to a method of, and apparatus for, metering gaseous fluids. The invention consists in subjecting the gas to be metered to ionization, preferably by exposure to the radiations from radio-active matter (for instance, some compound or preparation containing radium). This causes the gas to become ionized, in which condition it is able to conduct electric current to an extent sufficient for the purposes of the invention. The ionization is caused to take place within a metallic tube, of a capacity satisfactory for the maximum flow required for a particular size of meter.

At a suitable distance away from the radio-active preparation, within the tube, but carefully insulated from it electrically, is located a metallic electrode. The space between this electrode and the tube forms a gap in an electrical circuit, upon which gap there is impressed a suitable potential difference for the purpose required. This condition can be established either by use of batteries, or by utilization of any available source of alternating or direct current, with a suitable transformer, if necessary, or with alternating current and a suitable current rectifier, if it is desirable to use uni-directional current.

There is provided suitable means for measuring any current which may flow in this circuit, or the effect of any current, as the case may be, whenever the conductivity of the gaseous fluid in the gap between the electrode and the walls of the tube become sufficient to pass a current at the potential difference used.

In the accompanying diagram the numeral 1 designates a tube for the passage of gas to be metered. 2 is a source of radio-activity for causing formation of ions in gas flowing through the tube 1, and 3 is a metal electrode in the tube, but out of contact therewith, the electrode being supported by a carefully insulated conductor so as to leave a free space 4 between the electrode and the tube. This free space provides a region in which ions coming from the zone where they are formed can respond to an impressed electro-motive force to discharge themselves upon the surface of the tube, or electrode, as the case may be, and thereby to set up a flow of current in a circuit of which the tube 1, the gap 4, and the electrode 3 form a part. Any suitable means may be used for registering the flow of current in the circuit, or of creating by use of such current a means for releasing a sufficiently strong current to operate a registering device, such as the common type of watt meter, or an instrument of one of the types commonly used for plotting results upon a moving strip of paper.

The operation of this assembly as a meter will be as follows: When there is no flow of gas, the ions formed by the influence of the radio-active matter and from the radio-active matter itself will lose practically all their electric charges while they are still at a distance from the ionic discharge gap between the electrode and the tube; so that the non-conducting molecules of gases will not permit any flow of current. When flow of gas is in process, however, a greater or less number of ions will reach the gap, depending upon the rate of flow, and these will, in turn, permit a greater or less flow of current over the gap and through the circuit, which



A New Form of Meter.

directly or indirectly, controls the recording mechanism. This recording mechanism is calibrated so as to denote quantities of gas. The meter can be placed in adjustment by changing the distance between the radio-active matter and the ionic discharge gap.

A form of recording means is indicated in the diagram. The gap is connected across the plate and grid of a three-electrode valve 6, the filament of which is heated by the low tension battery 7. The anode battery 8 and grid biassing battery 9 are connected in series across

the gap, the battery 9 supplying a negative bias to the grid of the tube through the resistance 10. The ammeter 11, which may be a recording or integrating instrument, is connected in the plate circuit.

When there are ions present in the gas within the gap, a current will flow through the gap circuit under the influence of the potentials of the batteries 8 and 9. As the gap circuit includes the resistance 10, there will be such a fall of potential across this resistance as to reduce the negative bias on the grid of the valve. According to the well-known characteristics of the three-electrode valve, this will cause a flow of plate current, which will be many times the value of the current flowing through the gap circuit. An increase or decrease in the flow of the gas and the number of ions in the gap will produce a proportionate increase or decrease in the current flowing through the gap circuit, and a proportionate increase or decrease in the plate current.

Skip Hoists. – No. 331,319.

HUMPHREYS & GLASGOW, LTD., of 38, Victoria Street, S.W. 1, and FRYER, J. E. G., of South Woodford.

No. 14,071; May 6, 1929.

This invention has reference to skip hoists of the type in which the skip is guided in its movements by a track or guide; and the object is to provide an easily controlled arrangement whereby a charged skip can be raised to and lowered into a storage hopper automatically opened by contact with the material, and then raised so as to discharge its contents without considerable fall, and the empty skip returned to the charging position.

The skip is suspended from an axle or frame to the projecting ends or sides of which a pair of hoisting ropes is attached, the ropes passing over guide pulleys to a hoisting drum. Rollers are mounted on the ends of the axle or from the sides of the frame run in channel guides forming the track, which is constructed with two downwardly diverging portions, one portion extending to about the level of the bottom of the hopper, and the other extending to the skip-charging position. A track switch is adapted to be set automatically by the skip into the proper positions to ensure that, by means of the hoisting ropes, the skip can be made to travel from the charging to the discharging position and back again.

Skip hoists, according to this invention, enable a control man to cause the skip to travel up from the charging station and down to the discharging position, and then up from the latter and down to the charging station, by merely reversing the hoisting drum at the required times. In cases where the skip hoisting drum is electrically driven, switches may be adapted to be operated by the skip so as to reverse and stop the drum at the required times. The control man then simply has to switch on the current to the hoisting drum motor when the skip has been charged, and await its return; or the operation of the skip may be rendered fully automatic by the provision of additional switches, and if desired automatic means for filling the skip on arrival at the charging station, the arrangement being such that the skip, as soon as full, starts on its journey without the intervention of an attendant.

Applications for Patents.

[Extracted from the "Official Journal" for July 30.]

Nos. 21,925—22,621.

BROOM & WADE, LTD.—"High-pressure gas compressors." No. 21,977.

HEISE, G.—"Supports for burners in gas stoves." No. 21,985.

JOHNSON, J. Y. (I. G. FARBENINDUSTRIE AKT.-GES.).—"Gas producers." No. 21,996.

LIMBERG, H. L.—"Door for gas-generating retorts." No. 22,379.

PRESTAGE, E.—See Broom & Wade, Ltd. No. 21,977.

RADIATION, LTD.—"Gas fires." No. 22,311.

YATES, H. J.—See Radiation, Ltd. No. 22,311.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The chief characteristic of Stock Exchange affairs last week was the continued strength of the gilt-edged department. This was assisted by a recovery in Foreign Exchanges, and the reduction in the Treasury Bill rate, and British Funds in consequence closed with fractional increases on the week.

The Gas Market was well supported, and prices continued firm. Heavy buying of Imperial Continental capital stock caused a sharp rise in price of 15 points to 365. Brighton and Hove 6 p.ct. gained 2 points to 117½, and Tottenham ordinary 2 to 104. Commercial ordinary rose 1 point to 94½, and (at the local Exchange) Liverpool 5 p.ct. advanced a further ¾ to 93¾.

At Extraordinary General Meetings of the South Metropolitan and Commercial Gas Companies held last week the working agreement between the two Companies was agreed to unanimously by the proprietors. The agreement to become operative now requires the approval of the Board of Trade; and if and when this has been obtained, the necessary interchange of stocks can be proceeded with.

The Directors of the South Metropolitan Company have declared an interim dividend on the ordinary stock of 2½ p.ct. (unchanged), and the Metropolitan Gas Company (of Melbourne) are distributing a dividend for the half-year to June 30 at the rate of 6s. 6d. per share—the same as a year ago. This Company report a successful half-year's working. The net profit was £94,328 (against £89,356); and £8452 has been transferred to reserve, leaving £42,580 to be carried forward.

Coal Markets.

Again there were no signs anywhere of the activity which usually precedes a holiday, and markets are as dull as ever. The passage of the Coal Mines Act has received a varied reception among the colliery owners and the miners, and as between the various districts. Selling schemes previously outlined will have to be modified in many cases, which will entail some hard thinking to bring them into action in October, when they are expected to operate. Then there is the question of the shorter working day, which is to come into operation in four months from the passing of the Act. So that there are still unsettled times to come.

The uncertainty of the marketing schemes is still making forward transactions difficult. There are, for instance, possible buyers for next year of Durham export coal at slightly above current rates, but collieries find it difficult in the circumstances to make any firm price. Only one sale of any note is reported from the Newcastle market, Genoa Gas-Works having contracted for about 30,000 tons of Wear specials for August-September shipment at c.i.f. price which leaves about 15s. f.o.b. The current quotation for this quality is 15s. 3d., while bests ask 14s. 9d. to 15s., and seconds 12s. 9d. to 13s. 6d. The depression still covers all districts, and includes both home and export trade. Yorkshire screened gas is quoted at 15s. 6d. to 16s. 6d. for export.

In the coke market there appears to have been a definite all-round improvement. Patents are about 6d. better for early shipment, gas makes remain firm at round 21s. 6d.

Trade Notes.

Some Pratchett Bros. Manufactures.

From Messrs. Pratchett Bros., Ltd., of Denton Ironworks, Carlisle, we have received a folder illustrating some of the many and various products of this firm, who are manufacturers of all types of chemical and industrial plant. Among the apparatus set forth are rotary furnaces for calcining, roasting, and drying; grinding and mixing machinery; haulage and winding gear; ram pumps; miscellaneous chemical plant; and drying stoves and tunnels.

Steel Tube Coils and High-Pressure Pipework.

A new catalogue on steel tube coils and high-pressure pipework has been published by the Le Bas Tube Company, Ltd., of Dock House, Billiter Street, E.C. 3, which should be of interest to many in so far as it gives much useful information on the manufactures in which this firm specialize. Illustrations are given of various types of pipework that have been supplied, among them installations for refrigerating plant, superheaters, batteries, tubular railings, and special pipes and coils for various purposes.

Apparatus for Oil Testing and Analysis.

A useful and comprehensive catalogue has just been issued by Messrs. Baird & Tatlock, Ltd., of 14-17, Cross Street, Hatton Garden, E.C. 1, dealing with apparatus for testing and analysis of crude petroleum, petroleum products, coal tar, coal tar derivatives, &c. The catalogue covers the whole range of apparatus used in the testing of these products, and contains all the standard instruments which have been adopted by the various Standardization Committees, as is seen from a very complete summary and useful index at the end of the publication.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 5.

There are no changes to report in the prices of tar products during the past week.

Pitch is 47s. 6d. per ton f.o.b.

Creosote for export remains at 6d. to 6¼d. per gallon.

Pure toluole is 2s. 2d. to 2s. 3d.; pure benzole, 1s. 10d. to 1s. 11d.; and 95/160 solvent naphtha, 1s. 5d. to 1s. 6d.—all per gallon *ex* sellers' works.

Pyridine bases are still about 3s. 9d. per gallon *ex* sellers' works.

Aug. 2.

Tar Products in the Provinces.

The average prices of gas-works products during the week were: Gas-works tar, 20s. to 24s. Pitch—East Coast, 46s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 46s. f.o.b.* Toluole, naked, North, 1s. 7¼d. to 1s. 8¼d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3⅛d. Heavy naphtha, North, 1s. to 1s. 0¼d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3⅜d.; low gravity, 1¼d.; Scotland, 3¼d. to 3⅜d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. to 2s. 1d. July/December. Naphthalene, £12 to £14. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum, 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Aug.* 2.

Creosote oil has been in slightly better demand during the week, but other products remain unchanged. Inquiries for pitch for Autumn shipment are becoming more frequent.

Pitch.—Continental buyers are now making tentative inquiries for shipment from September onwards. The export value is about 45s. to 47s. 6d. per ton f.o.b. Glasgow. Home business is quiet at 47s. 6d. per ton f.o.r. makers' works.

Refined tar to Ministry of Transport specification is turning quieter, but meantime quotations are unchanged at 3¼d. to 3⅜d. per gallon *ex* works naked.

Creosote has been in better call, and values are steady. B.E.S.A. specification is 3¼d. to 3⅜d. per gallon; low gravity, 3d. to 3½d. per gallon; and neutral oil, 3d. to 3½d. per gallon—all free on rails in bulk.

Cresylic.—There are many inquiries but few orders. Pale 97/99 p.ct. is 1s. 8d. to 1s. 9d. per gallon; dark 97/99 p.ct., 1s. 7d. to 1s. 8d. per gallon; and pale 99/100 p.ct., 1s. 10d. to 1s. 11d. per gallon—all f.o.r. works.

Crude naphtha is in fair demand at 4¼d. to 4⅜d. per gallon; in bulk quantities *ex* works.

Solvent naphtha.—The market is quiet at about 1s. 2½d. to 1s. 3½d. per gallon for 90/160 grade, and about 1s. to 1s. 1d. per gallon for 90/190 grade.

Motor benzole—Quotations remain easy at 1s. 5⅜d. to 1s. 6¼d. per gallon.

Pyridines continue dull. 90/160 quality is nominal at about 3s. to 3s. 3d. per gallon.

The following are considered to be the market prices at the present time:

	s. d.	s. d.	
Crude benzole	0 10	to 0 11	per gallon at works
Motor ,,	1 5½	,, 1 6½ ,,	,, ,,
Pure ,,	1 10	,, 1 11 ,,	,, ,,

Contracts Advertised To-Day.

Pipes and Specials.

The Sidmouth Urban District Council invite tenders for a steel main and connections. [Advert. on p. 322.]

The Gas and Water Department of the Clacton Urban District Council invite tenders for the supply of cast-iron pipes and specials. [Advert. on p. 322.]

Metropolitan Gas Companies' Testings.

The Gas Referees' reports of the official testings for the past quarter give the following average calorific values for the gas supplied by the Metropolitan Companies named.

Commercial Gas Company.—502·9 B.Th.U. (declared calorific value, 500 B.Th.U.).

Gas Light and Coke Company.—503·3 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Metropolitan Gas Company.—561·2 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—550·7 and (from May 15) 563·4 B.Th.U. (declared calorific values, 550 and 560 B.Th.U.).

Tottenham and District Gas Company.—502·7 B.Th.U. (declared calorific value, 500 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—472·3 B.Th.U. (declared calorific value, 470 B.Th.U.).

Overseas Opportunities.

[From the Board of Trade Journal.]

Canada.

Kitchen Utensils, Hotel Equipment, Plumbers' Supplies, Ranges (Electric, Gas, and Coal), Refrigerators, Household Furnaces, &c.—A manufacturers' agent in the Province of Quebec desires to obtain British agencies for the sale of the above. He will do business on a commission basis, and sell throughout the Provinces of Ontario and Quebec. British manufacturers can obtain the name of the inquirer on application to the Department of Overseas Trade, 35, Old Queen Street, S.W. 1. (Ref. No. 79.)

South Africa.

High-Capacity Gas Meters.—H.M. Trade Commissioner at Johannesburg reports that the City of Johannesburg Stores Department is calling for tenders, to be presented in Johannesburg by Aug. 21, 1930, for the supply of high-capacity gas meters. Firms desirous of offering gas meters of British manufacture can obtain further particulars of this call for tenders upon application to the Department of Overseas Trade, 35, Old Queen Street, S.W. 1. (Ref. A.X. 9938.)

Denmark.

Steam-Driven Gas Exhauster.—The Commercial Secretary, H.M. Legation, Copenhagen, reports that the Copenhagen Lighting Department are calling for tenders for the supply and erection of a steam-driven gas exhauster. Firms desirous of offering an exhauster of British manufacture can obtain further particulars of this call for tenders upon application to the Department of Overseas Trade, 35, Old Queen Street, S.W. 1. (Ref. A.X. 9911.)

Gas-Works Plant.—The Commercial Secretary, H.M. Legation, Copenhagen, reports that the Copenhagen Lighting Department is calling for tenders, to be presented in Denmark by Sept. 15, 1930, for the supply and delivery of a complete gas-making plant, including vertical retorts, steam boilers for recovery of exhaust heat; two coal transporters, and two coke transporters. Firms desirous of offering plant of British manufacture can obtain further particulars of this call for tenders upon application to the Department of Overseas Trade, 35, Old Queen Street, S.W. 1. (Ref. A.X. 9915.)

Legal Intelligence

Trouble Over the Plans of a Gasholder.

Horace Foster, an architect, of Tudor House, Bridge Street, Walsall, was at Walsall County Court on Wednesday last awarded £20, balance of an account due to him in an action against the Walsall Corporation. Mr. D. L. Finnemore, Barrister, supported the claim, which had respect to plans made by the plaintiff of a gasholder which belongs to the Corporation.

Mr. J. HARPER SMITH, Solicitor, who defended the action, argued that the plans were not carried out according to agreement, and were done so slowly that further assistance had to be obtained.

Judge TEBBS, after hearing witnesses, said that if the work was done in the agreed time it did not matter, he thought, whether plaintiff was almost continually at work or not. He was astonished that the Corporation, having engaged a man to do the work, should have defended on the grounds they had done.

Winding-Up of Pontardulais Gas Company.

In the Chancery Division, last week, Mr. Justice EVE again had before him the petition for the winding-up of the Pontardulais Gas Company, Ltd.

Mr. H. WYNN PARRY, for the petitioners, reminded the Judge that it was arranged that the two persons who were anxious to purchase the Company's undertaking should appear before the Registrar of the Companies' Court and make their respective bids. An appointment had been taken, and Mr. Evan Williams was declared the purchaser at £4000. Mr. Perry added that he had now to ask that the petition be allowed to stand over for a sufficiently long period to give Mr. Evan Williams a reasonable opportunity of carrying the purchase through and obtaining the necessary consents of Parliament.

Mr. ROXBOROUGH, representing the debenture holders, said it was to their interest that the purchase should go through.

Mr. Justice EVE: £4000 is a very satisfactory figure. The Registrar referred it to the Judge in Chambers to settle the terms of the contract.

Mr. ROXBOROUGH said the real difficulty in the way of all of them, and which they had to surmount, was to obtain the sanction of the Board of Trade, and they had to make a Provisional Order which had to be laid before Parliament. As they were rapidly approaching the rising of Parliament it would mean some months' delay.

Mr. Justice EVE: It will have to stand over generally, but we can facilitate matters by a provisional contract. I think the best thing to do is to let the petition stand over generally to enable the Company to enter into a provisional agreement with the purchaser. Who appears for the Company?

Mr. ROXBOROUGH: The Company does not appear.

Mr. LEONARD STONE (for Mr. Evan Williams) said the contract need not be settled by the Court.

Mr. Justice EVE: There will be liberty to apply, and the petition will stand over generally.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Aug. 1.	Rise or Fall on Week.	Transact'ns Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 6	5	5	Aldershot 5 p.c. max. C.	73–78	..	..
522,992	,,	,,	4	4	Do. 4 p.c. Pref.	70–73	..	..
1,551,868	,,	Apl. 3	7⅜	7¾	Alliance & Dublin Ord.	92–95	–1	92½–93
374,000	,,	July 10	4	4	Do. 4 p.c. Deb.	60–63	..	..
522,655	,,	Mar. 6	7	7	Barnet Ord. 7 p.c.	109–112	..	110–111½
300,000	1	Apl. 24	1/4⅛	1/7⅛	Bombay, Ltd.	16/–18/–	..	16/–
174,500	10	Mar. 6	9	9	Bournemouth 5 p.c.	14–15	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12½–12⅝	..	12¼–12⅝
439,160	10	,,	6	6	Do. Pref. 6 p.c.	10⅝–11¼	..	..
50,000	Stk.	June 26	3	3	Do. 3 p.c. Deb.	54–57	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	72–75	..	..
357,900	,,	Mar. 20	7½	7½	Brighton & Hove 6 p.c. Con.	115–120	+2	118–119½
871,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	102–105	..	103–104
1,287,500	,,	July 24	5	5	Bristol 5 p.c. max.	88–89*a*	..	..
855,000	,,	Apl. 3	7	8	British Ord.	110–115	..	..
100,000	,,	June 26	7	7	Do. 7 p.c. Pref.	112–117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	70–73	..	..
450 000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	90–93	..	..
100.000	,,	June 26	5	5	Cambridge 5 p.c. Deb.	93–96	..	..
100,000	10	May 22	6	10	Cape Town, Ltd.	9–10	..	..
100,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref.	6½–7½	..	6⅞–7
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb.	69–74	..	..
626,860	,,	July 24	6	6	Cardiff Con. Ord.	94–97*	..	..
287,860	,,	June 26	7½	7½	Do. 7½ p.c. Red. Deb.	97–100	..	..
157,150	,,	Feb. 20	5	6⅔	Chester 5 p.c. Ord.	88–93*b*	..	..
98,936	1	May 8	†2/–	†2/–	Colombo, Ltd. Ord.	33/–35/–	..	..
24,500	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	18/6–20/6	..	..
375,402	1	Apl. 3	1/9⅜	1/9⅜	Colonial Gas Assn. Ld. Ord	17/–19/–	..	..
187,848	1	,,	1/7⅛	1/7⅛	Do. 8 p.c. Pref.	19/–21/–	..	19/6–20/–
2,073,280	Stk.	July 24	7	6	Commercial Ord.	93–96*	+1	94–95½
475,000	,,	June 26	3	3	Do. 3 p.c. Deb.	56–59	..	..
787,560	,,	Feb. 20	7	7	Croydon sliding scale	105–108	..	106
453,100	,,	,,	5	5	Do. max. div.	83–86	..	..
542,270	,,	Mar. 6	7	10	Derby Con.	†15–125*e*	..	..
55,000	,,	June 26	4	4	Do. Deb.	65–70*e*	..	..
209,000	,,	Mar. 6	5	5	East Hull Ord. 5 p.c.	71–73	..	..
1,002,180	,,	Mar. 20	†4*g*	†7*g*	European, Ltd.	110–120	..	110–115
18,629,125	,,	July 24	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	18/9–19/3*f* *	..	18/10½–19/3
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	62–64*	..	62–65½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76–79*	..	77–78¼
5,502,620	,,	June 26	3	3	Do. 3 p.c. Con. Deb.	58–61	..	59½–60½
2,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	97–100	..	100
161,480	,,	Feb. 20	10	10	Harrogate Cons. 10 p.c. max.	158–163	..	..
82,500	,,	Mar. 20	7	7	Hastings & St. L. 5 p.c. Conv.	99–104	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	78–83	..	..
70,000	10	May 22	†10	‡	Hongkong & China, Ltd.	13½–14½	..	..
213,200	Stk.	Mar. 6	6	6	Hornsey Con. 3½ p.c.	90–93	..	..
2,436,594	,,	May 22	10	25	Imperial Continental Cap.	355–375	+15	351–376
223,130	,,	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb.	80–85	..	..
285,242	,,	Mar. 20	8½	8½	Lea Bridge 5 p.c. Ord.	123–128	..	..
2,145,907	,,	Feb. 20	6	6	Liverpool 5 p.c. Ord.	93–94*b*	+½	..
600.000	,,	Mar. 20	7	7	Do. 7 p.c. Red. Pref.	100–102*b*	..	..
165,736	,,	Feb. 20	9	8	Maidstone 5 p.c. Cap.	119–124	..	..
63,480	,,	June 26	3	3	Do. 3 p.c. Deb.	51–54	..	..
75,000	£	June 26	†10	†10	Malta & Mediterranean Metrop'itan (of Melbourne)	5¼–6	..	..
392,000	—	Apl. 1	5½	5½	5½ p.c. Red. Deb.	90–93	..	..
541,920	Stk.	May 22	†6	†8	Montevideo, Ltd.	105–110	..	107½–109½
2,061,315	,,	July 24	5⅜	5	Newcastle & Gateshead Con.	15/6–16/3*d*f*	..	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref.	70½–71½*d**	..	..
691,705	,,	Dec. 19	3½	3½	Do. 3½ p.c. Deb.	66⅔–67¾*d*	..	..
169,940	,,	Mar. 6	7½	7½	North Middlesex 6 p.c. Con.	109–114	..	..
396,160	,,	Feb. 6	5	5	Northampton 5 p.c. max.	75–78	..	..
300.000	,,	Apl. 24	9	7	Oriental, Ltd.	108–113	..	112
60,000	£	13 My., '15	—	—	Ottoman	0–½	..	..
205,162	Stk.	June 26	8	8	Plym'th & Stonehouse 5 p.c.	105–108	..	..
424,416	,,	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std	110–115	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max.	78–81	..	..
186,000	100	June 2	4	4	Primitiva 4 p.c. Red. Deb.	96–99	..	..
677,837	Stk.	July 24	4	4	Do. 4 p.c. Red. Deb. 1911	79–82*	..	..
371.496	,,	June 26	4	4	Do. 4 p.c. Cons. Deb.	80–83	..	81½
150,000	10	Apl. 3	6	6	San Paulo 6 p.c. Pref.	8½–9	..	..
1,736.968	Stk.	Mar. 20	6½	6½	Sheffield Cons.	103–105*e*	..	..
95,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76–78*e*	..	..
90 000	10	June 5	‡4	‡5	South African	4–6	..	..
6,709.895	Stk.	Feb. 20	5	7½	South Met. Ord.	102–104	..	103–104
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	108–111	..	..
1,895.445	,,	July 10	3	3	Do. 3 p.c. Deb.	57–60	..	58⅜–59⅛
734.000	,,	Mar. 6	6⅛	6⅛	Do. 6⅛ p.c. Red. Db.	99–101	..	100–100⅛
91.500	,,	Mar. 20	8½	8½	South Shields Con.	106½–107¾	..	..
1,543,795	,,	July 24	6½	6½	South Suburban Ord. 5 p.c.	99–102*	..	100⅞–101¾
468,837	,,	June 26	5	5	Do. 5 p.c. Deb.	93–96	..	..
647.740	,,	Feb. 20	5	5	Southampton Ord. 5 p.c. max.	76–79	..	..
121.275	,,	June 26	4	4	Do. 4 p.c. Deb.	71–74	..	..
179,014	,,	July 24	8	8	Sutton Ord.	110–115*	..	..
67,828	,,	June 26	5	5	Do. 5 p.c. Deb.	93–96	..	..
250,000	,,	Mar. 6	7	7	Swansea 7 p.c. Red. Pref.	98–101	..	..
200,000	,,	June 26	6½	6½	Do. 6½ p.c. Red. Deb.	98–101	..	..
1,076,490	,,	July 24	6⅔	6⅔	Tottenham District Ord.	104–106*	+2	103–104
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	95–98*	..	..
199.005	,,	June 26	4	4	Do. 4 p.c. Deb.	73–76	..	..
182,880	10	30 Dec., '12	—	—	Tuscan, Ltd.	3¾–4¾	..	..
85,701	Stk.	Mar. 20	6	6	Do. 6 p.c. Red. Deb.	75–80	..	..
309,094	,,	Mar. 6	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	94–99	..	98
88,336	,,	,,	5	5	Do. 5 p.c. pref.	85–90	..	..
1,180,970	,,	July 10	—	7	Wandsworth, Wimbledon, and Epsom Cons.	107–112	..	108⅝–109
200,000	,,	,,	5	5	Do. 5 p.c. Pref.	87–90	..	87½
488,344	,,	June 26	5	5	Do. 5 p.c. Deb.	93–96	..	95½

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Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

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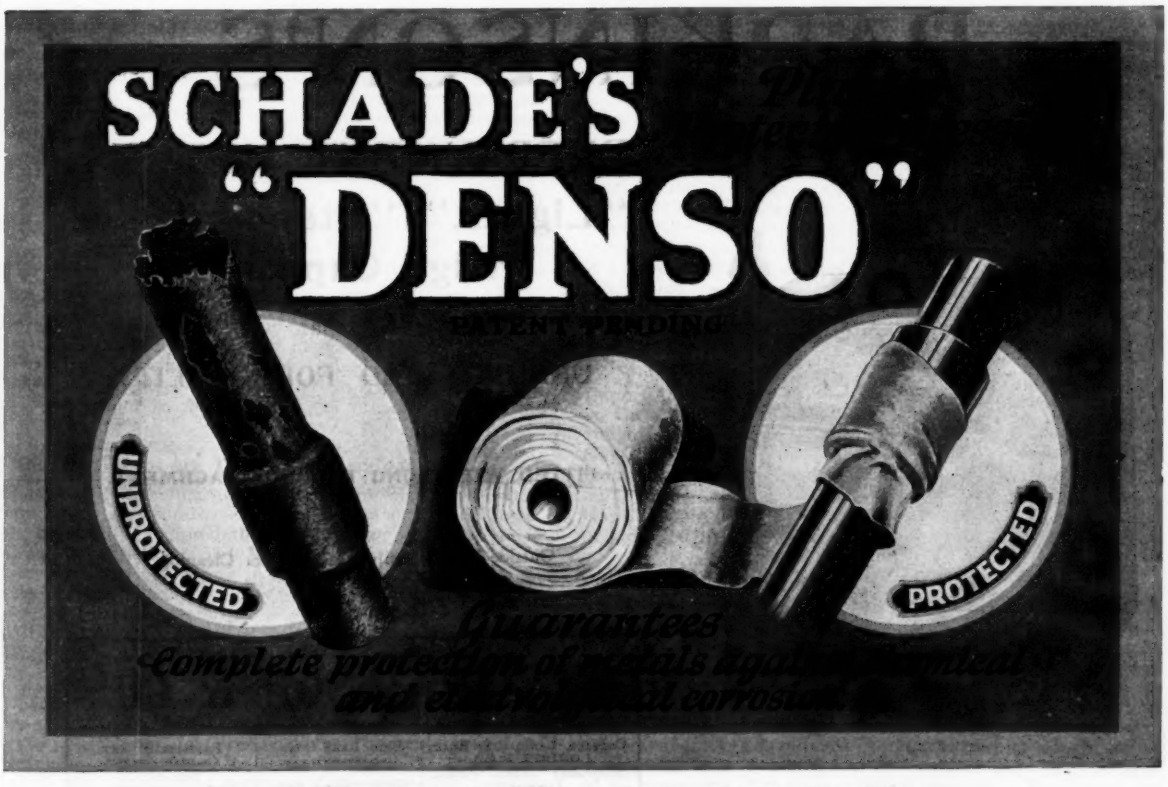

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